Registered at the G.P.O. for Transmission to Canada by Magazine Post.

VOL. 43. Ser. A. Part 4. pp. 97–128. APRIL, 1955.

THE REVIEW OF APPLIED ENTOMOLOGY

SERIES A: AGRICULTURAL.

ISSUED BY THE COMMONWEALTH INSTITUTE OF ENTOMOLOGY.

LONDON:
COMMONWEALTH INSTITUTE OF ENTOMOLOGY,
41, QUEEN'S GATE, S.W.7.

Price 4s. net.

Commonwealth Agricultural Bureaux

EXECUTIVE COUNCIL.

W. F. C. Morton, *Chairman*, Union of South Africa.

J. E. C. Coventry, B.A., M.Sc., *Vice-Chairman*, Federation of Rhodesia and Nyasaland.

B. C. Engholm, United Kingdom.

Lieutenant-Colonel J. G. Robertson, B.S.A., F.R.S.A., Canada.

W. Ives, M.Ec., Australia.

V. Armstrong, B.Sc., Ph.D., D.I.C., New Zealand.

P. N. Haksar, Counsellor (External Department) of the High Commissioner for India in the United Kingdom, India.

A. M. Chowdhury, Pakistan.

A. I. Perera, C.B.E. (for H. E. The High Commissioner for Ceylon), Ceylon.

C. E. Lambert, C.M.G., Colonial Territories.

Sir Herbert Howard, *Secretary*, Farnham House, Farnham Royal, nr. Slough, Bucks.

COMMONWEALTH INSTITUTE OF ENTOMOLOGY

Director and Editor.

W. J. Hall, C.M.G., M.C., D.Sc.

Assistant Director.

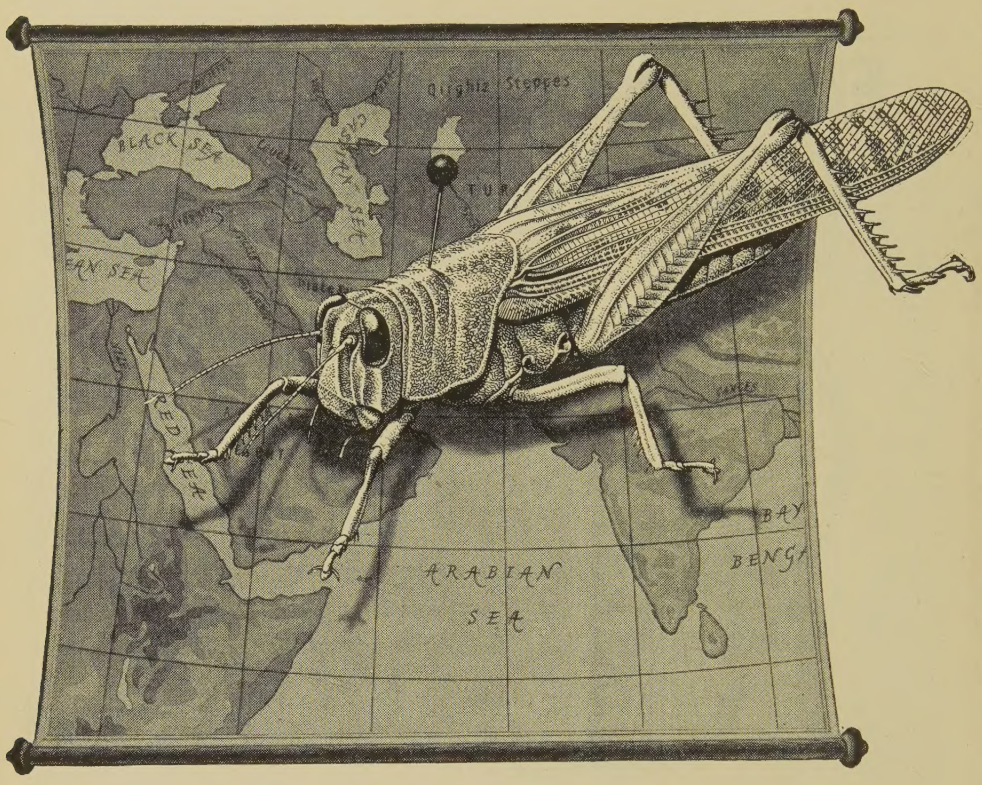
E. O. Pearson, B.A.

Assistant Editor.

H. S. Bushell, M.A.

Head Office—c/o British Museum (Natural History), Cromwell Road, London, S.W.7.

Publication Office and Library—41, Queen's Gate, London, S.W.7.



The case of *Schistocerca gregaria* . . .

One desert locust in the few months of its life eats about 30 times its own mature weight. That means about 2 oz. of food. But locusts move in millions, not ones and twos, stripping all vegetation in the path of the migration. A big swarm may devour many thousands of *tons* of precious crops to satisfy its appetite.

Locust control—so vital that it is organised internationally—has been much advanced recently by the development of aldrin. This Shell insecticide has been outstandingly successful as a locust killer in all the main areas of migration, right through the Middle East to India and Pakistan. Aerial spraying with aldrin emulsion is now widely used alongside traditional methods such as baiting.

Dieldrin, exceptionally persistent, is another Shell insecticide making locust news in the newly developed technique of egg bed spraying, which kills the hoppers on hatching.

Aldrin or dieldrin—just a few ounces per acre, according to the conditions—means certain death to locusts within a few hours.

Aldrin and dieldrin tackle insect pests with unrivalled effect and economy. Their surer kill is achieved with lower dosages. Their wider range includes many pests never before dealt with satisfactorily. Aldrin is fast becoming recognised as the best of all soil insecticides; dieldrin as the best control for weevils, beetles, flies, etc., on foliage. It is also extensively used as a residual spray against disease-carrying insects.

Have you a stubborn pest problem to be solved?

aldrin & dieldrin

aldrin and dieldrin are SHELL insecticides for world-wide use

For further information apply to your Shell Company. *Issued by The Shell Petroleum Company Limited, London, E.C.3, England*

Gäbler (H.). **Dipterenlarven als Parasiten und Synöken des Buchdruckers, *Ips typographus* L.** [Dipterous Larvae as Parasites and Inquilines in the Galleries of *I. typographus*.]—*Z. angew. Ent.* **35** pt. 1 pp. 55–62, 18 figs., 10 refs. Berlin, 1953.

In the course of investigations on *Ips typographus* (L.) in Germany, the larvae of various Diptera were observed in the galleries of the bark-beetle. These and the pupae to which they gave rise are described. It is unlikely that any were entirely predacious, but *Medetera* sp., probably *M. obscura* (Zett.), *Lonchaea* sp., probably *L. lucidiventris* Beck., and a larva believed to be a Stratiomyiid were seen feeding on the bark-beetle larvae, and one example of *Medetera* attacked an adult.

Paramonov (S.). **Hauptschädlinge der Ölkulturen der Ukraine.** [The principal Pests of Oil-seed Plants in the Ukraine.]—*Z. angew. Ent.* **35** pt. 1 pp. 63–81, 62 refs. Berlin, 1953.

Large areas of the Ukraine are given over to the cultivation of oil-seed crops, chiefly sunflower (*Helianthus annuus*), and in this paper, which is based largely on the literature, the author summarises information on the local distribution, bionomics and control of their principal arthropod pests. Those for which specific names are given are *Homocosoma nebulella* (Hb.), *Agapanthia dahli* (Richt.) and *Mordellistena parvula* (Gylh.) on sunflower, *Ceuthorrhynchus macula-alba* (Hbst.) on poppy (*Papaver somniferum*), *Etiella zinckenella* (Treitschke) on soy beans, *Aphthona euphorbiae* (Schr.), *Phalonia epilinana* (Zell.) and *Heliothis* (*Chloridea*) *dipsacea* (L.) on flax, *Urellia cluta* (Mg.) on safflower (*Carthamus tinctorius*), *Aphis gossypii* Glov. (*Doralis frangulae*, auct.) and *Tetranychus telarius* (L.) (*Epitetranychus althaeae* (v. Hanst.)) on cotton, and *Athalia rosae* (L.) (*colibri* (Christ)), *Meligethes aeneus* (F.), *Entomoscelis adonidis* (Pall.), *Phyllotreta* spp. and *Plutella maculipennis* (Curt.) on various crucifers.

Endrigkeit (A.). **Zur vorbeugenden Bekämpfung der Kohlfliege (*Chortophila brassicae* Bché.) bei Topfpflanzen im Pflanztopf- und Anzuchtbeetbegiessungsverfahren.** [Protective Treatments for Plants in Pots and Plant-beds against *Hylemyia brassicae*.]—*Z. angew. Ent.* **35** pt. 1 pp. 82–90, 11 refs. Berlin, 1953.

In further experiments in Schleswig-Holstein in 1950–52 on measures for the protection of young cabbage and cauliflower plants against *Hylemyia* (*Chortophila*) *brassicae* (Bch.) [*cf. R.A.E.*, A **42** 241], various proprietary insecticides were mixed with the whole of the potting soil or with that used to fill the holes only at the time of potting, or dusted or watered round the plants in the plant-bed shortly before they were set out. In the tests with dry preparations added to the potting soil at suitable rates, methyl-parathion dust remained effective only for 2½ months and BHC for three months but not for five. Applications to the plant-beds were made in April, about 3–4 weeks before infestation began. Various BHC and parathion emulsions gave practically complete control until harvest, wettable powders of BHC or BHC combined with DDT were inferior, BHC and methyl-parathion dusts were unsatisfactory, and DDT as wettable powder or in oil solution was ineffective.

(1791) Wt. P8522/3895 4/55 E.P. Ltd. Gp. 566. [A]

THIEM (H.). **Die Wirtspflanzen der San José-Schildlaus und ihre Bedeutung.** [The Food-plants of the San José Scale and their Significance.]—*Z. angew. Ent.* **35** pt. 1 pp. 91–122, 7 figs., refs. Berlin, 1953.

The author briefly reviews the main publications dealing with the food-plants of *Quadraspidiotus* (*Aspidiotus*) *perniciosus* (Comst.) in different parts of the world, discusses the difficulty of determining the food-plant range of Coccids, since their ability to establish themselves on a given plant varies with locality and even with different parts of the same plant, and gives two lists showing the known range of food-plants of *Q. perniciosus*. In the first and main list, the plants are arranged systematically, and the degree to which they are infested (according to an arbitrary scale) in the United States, the Soviet Union, France, Switzerland, Italy and Germany, so far as information is available, is shown, with records of infestation in other countries for some. The second is an alphabetical list of plant orders and families showing the genera infested and the countries concerned, with cross-references to the main list. The wide range of food-plants of the Coccid renders permanent control difficult, and its implications in this respect are discussed.

MÜLLER (H. J.). **Der Blattlaus-Befallsflug im Bereich eines Ackerbohnen- und eines Kartoffel-Bestandes.** [Aphid Flight in the Vicinity of Plots of Beans and Potato.]—*Beitr. Ent.* **3** no. 3 pp. 229–258, 15 figs., 16 refs. Berlin, 1953.

Since the initial infestation of field crops by winged Aphids is of importance in the spread of virus diseases, and traps consisting of dishes painted yellow and filled with water appeared the best adapted for studying it [*cf. R.A.E.*, A **35** 359; **41** 8], such traps were used in Germany in 1952 to investigate initial infestation by alates of *Aphis* (*Doralis*) *fabae* Scop. and *Myzus* (*Myzodes*) *persicae* (Sulz.). Previous observations on flight in these Aphids showed that the alates became active under specific favourable conditions of temperature and humidity with little or no wind. They flew upwards to considerable heights and were then borne passively by air currents for long distances ignoring prospective new food-plants. This phase was succeeded by a further period of active flight, which was spent close to the ground, in search of food-plants. The direction of this flight was against the prevailing wind and the Aphids alighted on and abandoned several plants before finally settling and reproducing. For investigations on this last phase of flight, two plots of land of about equal dimensions so situated as almost to enclose a right angle were sown, one with field beans (*Vicia faba*) and the other with potatoes. The ground in the angle was kept free from vegetation. When the plants showed above the ground, pairs of trap dishes were stationed on bare soil in the angle about 11 yards away, near the middle of each plot, and at a distance inside and outside its inner edge equal to the height of the foliage. One of each pair was placed on the ground and the other was kept level with the top of the foliage, the height being adjusted each week. Counts of the Aphids in the traps were made each morning, those in the beans from 16th May to 15th August and those in the potato plot from 14th June to 5th October, and counts of the Psyllid, *Trioza nigricornis* Först., were also made for comparative purposes. The numbers of all three insects were low until July but subsequently rose considerably, and the results are compared for the period between 10th July and 7th August, when both crops were still vigorous and about equally attractive and Aphid flight was at its maximum.

Characteristic data from the catches are given, and the results of the whole experiment discussed in detail. All three insects were taken at all

the trap positions, and though the numbers varied from day to day, the relation between the various positions remained remarkably constant. Most Aphids were taken in the lower of the traps on the bare ground, followed by the lower traps in front of the crops, whereas hardly any were taken inside the plant stand, especially when the plants became full-grown, or at the higher levels outside it. *T. nigricornis* behaved similarly. It is concluded that flight occurred mostly at ground level and was only a sixth as intense at a height of three feet. When an obstacle, such as dense vegetation, was encountered, the insects were diverted sideways rather than vertically, and infested only the peripheral rows, whereas they penetrated into the interior of plots when the plants were widely spaced. *M. persicae* and *T. nigricornis* were taken as frequently among the beans as on potato, but *A. fabae* was consistently much more numerous in the bean plot. Possible reasons for this are discussed, and it is concluded that the beans were attractive to this Aphid, though not over great distances, since no more were caught in the dish only 11 yards away than in the other dish on bare soil. The distribution of infestation by *A. fabae* on the beans was examined on 27th June and again on 24th July, and it was found that although infestation increased in extent and severity, the foci remained concentrated round the edges of the plot and, to a somewhat less extent, along the borders of the path dividing it, indicating that though numerous Aphids were still migrating to the plants, no important new centres of infestation arose in the centre of the plot after the foliage had become dense [*cf.* **39** 48]. A practical conclusion from this is that sowing early, so as to produce a dense plant stand at the time of Aphid flight, would reduce infestation. It might also prove possible to protect crops by screens of higher vegetation grown round them.

Schweiger (H.). *Otiorrhynchus* (*Arammichnus*) *ligustici* **L. als Rosenschädling. (Mit kurzen Bemerkungen über** *O.* (*Tournieria*) *crataegi* **Germ. und** *Liophloeus tessulatus* **Müll.)** [*O. ligustici* as a Pest of Roses. (With brief Notes on *O. crataegi and L. tessulatus*.)]—*Beitr. Ent.* **3** no. 3 pp. 337–342, 8 refs. Berlin, 1953.

Overwintered adults of *Otiorrhynchus ligustici* (L.) caused serious injury to rose plants in a large nursery near Vienna in April 1952, and since a DDT spray proved ineffective, mechanical methods of control had to be employed. The habits of the weevils are briefly described, and observations on local distribution and natural enemies are recorded. *O. crataegi* Germ., which was first observed in Austria in 1923, feeds on elder hedges in July–September near Vienna and is also recorded from other parts of Austria. *Liophloeus tessulatus* (Müll.), which has a similar distribution, is not known to be injurious.

St. Amand (W.) & Cloyd (W. J.). **Parasitism of the Grasshopper,** *Chortophaga viridifasciata* **(Degeer) (Orthoptera: Locustidae), by Dipterous Larvae.**—*J. Parasit.* **40** no. 1 pp. 83–87, 14 figs., 6 refs. Lancaster, Pa., 1954.

Nymphs and adults of *Chortophaga viridifasciata* (Deg.) collected in Tennessee, especially nymphs collected in the autumn and winter, were found to be parasitised by *Ceracia dentata* (Coq.) and *Sarcophaga hunteri* Hough. In addition, puparia of *C. dentata* yielded the Chalcid hyperparasite, *Brachymeria tegularis* (Cress.). *C. dentata* was the more abundant of the two primary parasites. Larvae of this Tachinid in three well-defined stages were found on dissection of grasshoppers and are described.

Larvae in a fourth stage, indistinguishable from the third, leave their hosts and pupate, and a description of the puparium is given. The pupal stage lasted about two weeks at room temperature. The mode of development of the larvae in their hosts is discussed.

Hecht (O.). **Plagas agrícolas. Introducción a la biología de las plagas causadas por insectos y los métodos de combatirlas.** [Agricultural Pests. Introduction to the Biology of Insect Pests and Methods of controlling them.]—9½ × 6¼ ins., xi + 199 pp., 74 figs., 26 refs. Mexico, D.F., Edit. cient. latino amer. Libertad, 1954.

This book provides growers and other non-specialists in entomology with essential information on the appearance, bionomics and control of the principal insect pests of certain field crops in Mexico. The crops concerned include maize, potato, tomato, beans and several other vegetables. Most of the chapters deal with individual pests, but some containing general information on the physiology and classification of insects, natural enemies and biological control, and the composition and use of insecticides are introduced at appropriate points in the text.

Leiderman (L.). **Efeitos de modernos inseticidas orgânicos em tomateiros.** [The Effects of modern organic Insecticides on Tomato Plants.]—*Biológico* **20** no. 6 pp. 93–98, 4 refs. São Paulo, 1954.

In investigations in São Paulo in 1954, tomato seedlings were sprayed with several organic insecticides, with a spreader and adhesive, six times at intervals of four days (either twice at a lower concentration and four times at a higher one, or six times at the higher one), beginning 12 days after sowing, and compared with untreated plants for height and weight four days after the last application. Malathion in an emulsion spray at 0·06 increasing to 0·12 per cent., nicotine sulphate (with soap) at 0·04 increasing to 0·08 per cent., BHC in a wettable powder at 0·02 increasing to 0·03 per cent., and methoxy-DDT in a wettable powder at 0·2 per cent. throughout caused little reduction in growth, whereas methoxy-DDT at 0·1 increasing to 0·2 per cent. reduced weight and height considerably. DDT in a wettable powder was slightly injurious at 0·1 increasing to 0·2 per cent., but caused considerable reductions in weight and height and chlorosis of the leaves at 0·2 per cent. throughout. Chlordane in an emulsion spray, which was the most injurious of the materials tested, caused twisting and stunting at 0·1 increasing to 0·2 per cent., and Metacide emulsion concentrate (6·1 per cent. parathion and 24·5 per cent. methyl-parathion) caused similar effects at 0·02 increasing to 0·03 per cent. Toxaphene in a wettable powder at 0·1 increasing to 0·2 per cent. also caused reduction in size, twisting and chlorosis. Only BHC, malathion, methoxy-DDT and nicotine sulphate are considered sufficiently safe for use on young tomato plants at the concentrations tested.

Savary (A.). **Le puceron cendré du poirier** (*Sappaphis pyri* **Fonsc.) en Suisse romande.**—*Landw. Jb. Schweiz* **67** pt. 3 pp. 247–314, 2 pls., 13 figs., 46 refs. Berne, 1953. (With a Summary in English.)

Anuraphis (*Sappaphis*) *pyri* (Boy.) is the most important of the Aphids that attack pear in Switzerland. It is widely distributed up to an altitude of about 4,000 ft. and is particularly numerous in the Rhône valley and the

areas bordering the lakes in the west. Its synonymy (according to Hille Ris Lambers) and world distribution are reviewed, its various forms, including individual stages of them, and the technique adopted for making preparations are described, and an account is given of observations on its bionomics and control begun in 1947.

For studies on its bionomics, *A. pyri* was reared in the laboratory on cut pear twigs about three inches long with only the last two leaves and the terminal bud remaining, which were kept in jars containing a nutritive solution and sprinkled with water every other day, thus remaining fresh for about three weeks. It was also reared in the field in gauze bags on the tips of the branches, and general observations were further made in orchards. Development on the secondary food-plant (*Galium*) was observed only on caged plants in the field, as rearing in the laboratory failed through the absence of ants, which are essential for the removal of the honeydew produced.

It was found that the winter eggs were laid exclusively in crevices that occurred in and round the fruit scars as a result of the presence of dried fragments of the fruit stalks remaining after early picking or of the partial detachment of the apical portion of the scar itself. Mortality of the eggs ranged from 20 to 40 per cent., but no parasitism was observed. Hatching began on 3rd March in 1948 and 3rd April in 1949, about the time of bud-burst, and the fundatrices fed at the bases or near the main veins of the still unexpanded leaves or on the peduncle or calyx of the flower buds. There were four instars, lasting 4–5, 3–7, 3–6 and 3–6 days, respectively. As the leaves expanded, all the fundatrices moved to the lower leaf surfaces, where they fed near the base of the main veins, and their feeding caused the leaves to roll. Adult fundatrices were observed between 14th April and 15th May in 1947, 27th March and 17th April in 1948, 19th April and 6th May in 1949, and 18th March and 22nd April in 1950. They gave rise to 17–68 virginoparae each, with an average of 39·3. These were first found on 20th April in 1949 and on 19th March in 1950, and they were succeeded by four similar generations, infestation gradually spreading all over the tree. Alates appeared in the first of these and became increasingly numerous in the three succeeding generations. The dates on which the first alates were found ranged from 18th May in 1947 to 27th May in 1948 in the rearing cages, and from 2nd June in 1949 to 16th June in 1948 in the field. The duration of development and the fecundity diminished with successive generations. The abundant honeydew secreted by the dense colonies of Aphids attracted ants and other insects and favoured the development of sooty mould.

Migration began in early June and was almost completed by the beginning of July, few Aphids remaining on pear after mid-July. The summer food-plants are species of *Galium*, and in tests the only ones commonly infested were *G. mollugo* and *G. aparine*; *G. sylvaticum* was very occasionally colonised, and attempts to establish *A. pyri* on other species in the laboratory were unsuccessful. A period of flight before colonisation appeared essential, the Aphids not settling immediately even when suitable plants were placed directly beneath the tree on which they had developed. After settling on *Galium*, the Aphids fed and gradually moved to the lower parts. Reproduction began after 24–36 hours, the Aphids producing 7–14 nymphs each, with an average of 11·1. These descended to the base of the plant, and the following generation developed at the collar or on the roots, just below the soil surface. Colonies on *Galium* were numerous until the end of July, when they decreased in number and size, owing partly to the activity of predators, but mainly to the absence of ants, and the number per colony increased again from the end of August. Ants were found to

be almost indispensable for development except in very dry localities, since they removed the accumulations of honeydew that otherwise obstructed the deposition of the nymphs. A list is given of the seven species observed. Several generations of the Aphid developed on *Galium* during the summer, and some alates were produced that migrated to other *Galium* plants. Development lasted 8–12 and 12–14 days in July–August and September, respectively.

Gynoparae appeared about mid-September and migrated to pear, on which they settled on the leaves, mostly on the south or south-west sides of the trees, and gave rise to oviparae. These paired with males that migrated from *Galium* at about the end of September, one male being sufficient to fertilise a whole colony of females, and winter eggs were laid at the rate of 2–7 per female, with an average of 3·9. Oviposition was last observed in the various years between 29th October and 10th November. A few intermediate forms with only rudimentary wings were found on both pear and *Galium*, and small colonies of apterae that remained on pear throughout the summer were observed on two occasions.

A list is given of the predators, parasites and hyperparasites of *A. pyri* observed. Of the predators, Syrphid larvae were the most effective. The parasites were of little importance, though the Braconids, *Ephedrus lacertosus* (Hal.) and *E. validus* (Hal.), emerged regularly in cultures.

The damage caused to pear is due to the interruption in the flow of sap, the injection of toxic saliva, and the creation of conditions favourable for the development of sooty mould, and measurement of the main branches on untreated infested trees showed that their rate of growth was only about one quarter or one half that on trees that had been treated against the Aphid. There are considerable varietal differences in degree of infestation, and a list is given showing the comparative susceptibility of the main varieties of pear grown in Switzerland, one of which is hardly ever infested. The leaf symptoms caused by various Aphids on pear are briefly described and figured.

The usual methods of Aphid control on fruit trees are discussed, and it is pointed out that winter sprays are of doubtful value against the eggs of *A. pyri*, which are well protected in the fruit scars. In experiments in 1948, winter sprays of DNC, DNC in oil, and tar distillate were applied in mid-February to trees that had had the attachments on the fruit scars removed and to those that had not, and some trees in both classes were left unsprayed. Counts made on 22nd April showed that removal of the attachments alone was as effective as spraying alone, and that a combination of both measures gave good reductions in infestation. Removal of the attachments is practicable, however, only on low-growing trees.

Spring treatments are best applied just before or just after flowering, since they destroy the fundatrices or young colonies before much damage has been caused, are less injurious to beneficial insects than when applied later, and can be added to the fungicidal sprays usually applied at that time. The advantages and disadvantages of various BHC preparations and phosphorus compounds for use against the Aphid are discussed. Though parathion is extremely effective and penetrates leaf tissue, it also kills beneficial insects. Details are given of experiments in which various proprietary products were applied against *A. pyri*. Complete or almost complete mortality was given by dusts containing unstated percentages of parathion, by emulsion sprays of 0·02 and 0·007 per cent. parathion, and by painting the rolled leaves with emulsions containing 0·04, 0·06 or 0·1 per cent. parathion. Slightly less effective results were obtained with sprays of wettable DDT, and a rotenone dust and sprays containing nicotine were considerably less effective.

In tests with systemic insecticides, which are harmless to beneficial insects, schradan was effective when applied to the roots of an infested plant, destroyed Aphids on the lower surface of a leaf if applied to the upper surface, on one half of a leaf if applied to the other half, and on the distal leaves if applied to the proximal ones. It retained its effectiveness for about three weeks, and two applications 3–4 weeks apart would control infestation throughout the season, whereas parathion loses its toxicity in a fortnight. In tests in 1950 on groups of 50 trees, the numbers of colonies of *A. pyri* were 68 for no treatment, 37 and 7 for winter sprays of tar distillate and DNC, respectively, and 12 and 1 for sprays of 0·02 per cent. parathion and 0·044 per cent. schradan, respectively, applied after flowering. Schradan is recommended, and the possibility of forecasting high infestation by counts of winter eggs is briefly discussed.

Bournier (A.). **Le thrips du glaïeul,** *Taeniothrips simplex* **Morison.**—*Phytoma* **7** no. 58 pp. 10–13, 6 figs. Paris, 1954.

The author states that *Taeniothrips simplex* (Morison) has been present on *Gladiolus* in France for some years [*cf. R.A.E.*, A **37** 61], describes its bionomics, its mode of spread, and the damage caused to the leaves, flowers and corms, and reviews methods of control. An emulsion spray containing 0·016 per cent. parathion applied to the young plants was effective in controlling infestation, and applications at intervals of ten days prevented all damage to the flowers. Other methods include the use of a dust of 5 per cent. DDT on the stored corms and treatment of the soil, 20 days before planting, with BHC or polychlorocyclane sulphide at the rate of 10·8–11·7 lb. technical compound per acre, followed by harrowing, unless the temperature of the soil at a depth of 4 ins. drops to −6°C. [−21·2°F.] during the winter, which kills any thrips present.

Simon (H.) & Merling (R.). **Les mineuses des feuilles des arbres fruitiers.**—*Phytoma* **7** no. 58 pp. 28–29, 2 figs. Paris, 1954.

Infestation by *Lyonetia clerkella* (L.) and *Leucoptera* (*Cemiostoma*) *scitella* (Zell.), which occurs on a small scale on apple every year near Paris, became severe on various fruit trees in 1953. The bionomics of these leaf-miners are briefly reviewed [*cf. R.A.E.*, A **28** 99–100; **36** 269, etc.]. Many leaves were infested by both species and were extensively mined. All the leaves on some trees were attacked, and most of them had dried up and fallen by late July or early August, causing the fruits, especially pears, to remain undersized or fall.

Bouron (H.) & Perrot (A.). **Essai de traitement contre les Tétranyques des arbres fruitiers.**—*Phytoma* **7** no. 59 pp. 15–16. Paris, 1954.

In the test described, sprays of Pyrazoxon [diethyl 3-methyl-pyrazolyl(5) phosphate], demeton [diethyl 2-(ethylmercapto)ethyl thiophosphate] and Chlorobenzilate [2,2-bis(p-chlorophenyl)-2-hydroxyethyl acetate] were applied against *Tetranychus cratacgi* Hirst (*Amphitetranychus viennensis* (Zacher)) on pear near Paris, at 0·04, 0·025 and 0·025 per cent. actual toxicant, respectively, on 23rd May 1953, when immature mites still predominated, in comparison with 0·02 per cent. parathion. Counts of living adults and immature mites after treatment showed that the numbers per 240 leaves were 30 for demeton, 450 for parathion, 611 for Pyrazoxon, and 1,051 for Chlorobenzilate, as compared with 1,527 for no treatment.

Targe (A.), Deportes (L.) & Joubert (R.). **L'Aleurode (*Dialeurodes citri* Ash.) et les traitements des agrumes dans les Alpes-Maritimes.**—*Phytoma* **7** no. 59 pp. 28–32, 1 fig., 2 graphs, 9 refs. Paris, 1954.

Further observations on *Dialeurodes citri* (Ril. & How.) on *Citrus* in the Department of Alpes-Maritimes in 1953 [*cf. R.A.E.*, A **42** 248] showed that the larvae overwintered and gave rise to adults towards the end of April. The females oviposited after 2–3 days, and the duration of the egg stage varied between 15 days and a month. Three generations only were observed [*cf. loc. cit.*], the peaks of adult emergence being reached in late May, early August and early October.

Sprays of white oil alone or with DDT or parathion, or parathion alone, were applied against the overwintered larvae on 20th March. Complete control was given by 1 or 1·5 per cent. of a white oil containing 83 per cent. actual oil. Parathion alone at 0·015 per cent. in emulsion or wettable-powder sprays was rather ineffective, and the toxicity of the mixed sprays appeared to vary solely with their oil content. Of the materials tested in sprays against the eggs, which included parathion, dieldrin, and white oil alone or with DDT, only parathion at the high concentration of 0·1 per cent. showed any ovicidal effect, but white-oil sprays containing at least 0·8 per cent. actual oil killed all larvae that hatched after treatment, and the 1·5 per cent. white-oil spray retained its effectiveness in this respect for a month. It is recommended that this should be applied before the appearance of adults of the overwintered generation (April), immediately after the flight of these adults (June), and at the end of the flight of the second generation (late October). In a test in which this programme was followed on orange trees of several varieties that were heavily infested in spring, the spray dates selected being 11th April, 6th July and 22nd October, the trees were found free from infestation and maturing a good crop in autumn. The oil sprays also control other pests of *Citrus*. It is pointed out that they should be applied as a mist, in order to avoid injury to the leaves, and that though three applications may not always be necessary, a fourth, in late August, may sometimes be advisable.

Berim (N. G.) & Édel'man (N. M.). **The physiological Resistance of Insects to DDT and BHC and Ways of overcoming it.** [*In Russian.*] —*Ent. Obozr.* **32** pp. 15–26, 3 graphs, 19 refs. Moscow, 1952.

An account is given of investigations on factors affecting the physiological reactions of *Agelastica alni* (L.), *Opatrum sabulosum* (L.) and *Curculio* (*Balaninus*) *glandium* Marsh. to DDT, BHC, or mixtures of the two, the main results of which as regards the last two insects have already been noticed [*cf. R.A.E.*, A **40** 221; **41** 427]. In tests with *A. alni* carried out between April and September to study the resistance of the adults at different ages, field-collected beetles were dusted in the laboratory with 5 per cent. DDT, and records were kept of their mean survival periods, fat contents and intensity of respiration. Resistance was greatest in over-wintered beetles taken from their hibernation sites in mid-April, the mean survival period being 65 hours, and these also showed the lowest intensity of respiration and a high fat content. With the resumption of activity, resistance progressively decreased. It was lowest in females that had completed oviposition, which succumbed in a mean of six hours, and these showed the greatest intensity of respiration and the lowest fat content. Resistance was fairly high in young beetles about to enter hibernation in the second half of September, the mean survival period being 42 hours; these contained the maximum percentage of fat, but the intensity of

respiration was also fairly high. A general inverse relation between respiration and resistance was also shown in another series of experiments, in which adults of *A. alni* and larvae in the third and fourth instars were confined for an hour on celluloid films in which DDT or BHC had been incorporated; exposure of this kind is stated to preclude direct penetration of the insecticide through the cuticle and thus to eliminate any barrier effect of fats [*cf.* **37** 43–44]. Larvae in the third instar were the quickest to succumb to either insecticide and showed the greatest intensity of respiration. The relation was still more pronounced when comparisons were made at different times of the day. Adults of *A. alni*, *Harpalus rufipes* (Deg.) (*Pseudophonus pubescens* (Müll.)) and *Anisoplia austriaca* (Hbst.) were confined on celluloid films containing BHC for 30–60 minutes at 1 p.m. and at midnight, these being times of maximum and minimum consumption of oxygen, respectively, and in all cases insects exposed at night survived the longest. Though the relation may not be important in the case of insects continuously exposed to insecticide deposits, it may influence mortality from materials that decompose rapidly or from dusts that are easily blown from the plants.

Kozhanchikov (I. V.). **The Question of the vital thermal Optimum. IX. Temperature Scale as a Factor in the Development of the Gipsy Moth and the Oak Saturniid.** [*In Russian.*]—*Ent. Obozr.* **32** pp. 27–42, 5 graphs, 34 refs. Moscow, 1952.

In this paper, which is part of a series [*cf. R.A.E.*, A **22** 347, 663; **23** 753; **24** 46, 640; **25** 265; **35** 342], an account is given of laboratory investigations carried out in 1947–49 to compare the adaptability of the larvae of *Lymantria* (*Ocneria*) *dispar* (L.) and those of *Antheraea pernyi* (Guér.) to changes in temperature. In nature, the former develop in spring and early summer, when the temperature in deciduous forests is changeable, whereas *A. pernyi* develops in summer, when the temperature in them is more stable. The following are the author's conclusions from the work.

Variability in temperature, as expressed by the daily range, is one of the factors that affect insects under natural conditions. Ability to withstand this range of temperature is specific. The development of *A. pernyi* normally takes place at temperatures of which the daily range does not exceed 10°C. [18°F.], whereas in *L. dispar* normal growth is possible at temperatures with a daily range of up to 18°C. [32·6°F.].

The influence of the daily temperature range on growing insects was studied in connection with its effect on the processes of nutrition. The course of growth is normal under changeable temperature conditions so long as the fluctuations in temperature and consequent variations in the rate of feeding permit the insect to utilise the average amount of food consumed. Interruption of the daily feeding rate by temperature changes suppresses growth and disorganises development. Variations in the daily range of temperature have an unfavourable effect on the development of *A. pernyi* and *L. dispar*. As the range widens, the weight of the larvae decreases and larval mortality and the duration of development increase. The results on the survivors are a decrease in the viability of the pupae and in the fertility of the females.

The effect of changeable temperatures on growth is related to the lability of the processes of larval development [*cf.* **35** 342]. *L. dispar*, which manifests a greater lability in the processes of development, shows a greater stability with regard to temperature changes than does *A. pernyi*. In this respect, lability should be understood as the ability of an organism rapidly to co-ordinate its working as a whole in the presence of the changes in the

rates at which the physiological processes proceed. The unfavourable influence of temperature changes is least at the optimum temperature for a given species. *A. pernyi* and *L. dispar* react differently to unfavourable temperature changes. Larvae of *A. pernyi* show considerable adaptability in the early instars and increasing specialisation in the later ones. Thus, mortality in the final stages of growth increases at unfavourable temperatures. *L. dispar*, on the contrary, shows a high rate of mortality at unfavourable temperatures in the early instars but later becomes more resistant.

Boldaruev (V. O.). **Parasites of the Siberian Lasiocampid (*Dendrolimus sibiricus* Tshtv.) in eastern Siberia.** [*In Russian.*]—*Ent. Obozr.* **32** pp. 56–68, 3 figs., 13 refs. Moscow, 1952.

Dendrolimus superans (Btlr.) (*sibiricus* Chtv.) is an important pest of Siberian cedar [*Pinus sibirica*] in the forests of eastern Siberia, and investigations on its parasites there were carried out between 1940 and 1950. A list is given of the 18 species found, showing the districts in which they occurred and the stages of the host attacked, together with notes on their appearance, bionomics and importance. The most effective were the Scelionid, *Telenomus gracilis* Mayr, and the Encyrtid, *Ooencyrtus pinicola* (Mats.), which attack the eggs, and the Tachinid, *Masicera zimini* Kolomiets, and the Braconid, *Rhogas dendrolimi* (Mats.), which parasitise the larvae. The first three are specific to *D. superans*, and the fourth has no other host in eastern Siberia.

T. gracilis had only one generation a year, the overwintered adults being on the wing from the beginning of June to the beginning of August and maximum flight occurring in July, when the host eggs are laid. Oviposition occurred after 1–2 weeks, each female attacking about 20 eggs of *D. superans*. From 5 to 10 parasites, with an average of 7, developed in a single host egg, and females were three times as numerous as males. Females that fed on sugar solution deposited an average of 110 eggs each, with a maximum of 130, and unfertilised examples gave rise to males only. The duration of development averaged 24 days in the laboratory at more or less constant temperature and humidity and 53 days in the field. The adults emerged from about 20th August until the end of September or early October, paired soon after, and hibernated in dry forest litter. *T. gracilis* afforded important control, the percentage of eggs parasitised by it being about 80–100 in centres of infestation and 50–83 at their edges.

O. pinicola was on the wing in June and July and parasitised about 10 per cent. of the eggs of its host in 1948. In the laboratory, up to five individuals, with an average of three, developed in each parasitised egg. Females that fed on sugar solution deposited an average of 80 eggs each, with a maximum of 100, and a single female parasitised an average of 34 host eggs. Females were four times as numerous as males, and unfertilised examples gave rise to males only. The duration of development was similar to that of *T. gracilis*, and the adults emerged at the same time as those of the latter. It is not known where they overwinter.

Adults of *M. zimini* were present in August and part of September, and dissection showed that the females contained several thousand eggs each. The eggs are laid on the needles of the trees and are apparently ingested by host larvae in the first instar with their food. The life-cycle lasts two years, the larvae overwintering twice in their hosts and leaving the host pupae at the end of June or the beginning of July. They pupated in the ground litter, the pupal stage lasting about a month. On an average, three

parasites developed in a single host, and the percentage parasitism varied from 20 to 63 in 1948–49.

R. dendrolimi also had a two-year life-cycle. The adults were present from mid-July to about 20th September, and fed during the first 25–30 days on the honeydew of Aphids. Oviposition began about 10th August, in larvae of the second and third instars. Parasitised larvae hibernated and reached the fourth instar by the beginning of July, at the same time as non-parasitised individuals, but their development then ceased almost completely. They hibernated a second time, however, but ceased feeding in the following May and crawled about on the lower parts of the trees. The parasite larvae resumed feeding in spring, killed their hosts by gnawing a hole through the thorax, glued them to the trunks by means of a liquid ejected through the hole, and completed their development in the remains. They pupated in June or the first half of July, and the adults emerged between 10th and 20th July through the dorsal side of the mummified host, the males first and the females some 10 days later. The two sexes were equal in numbers. Of the comparatively few larvae of *D. suprans* that occurred in the crown of the trees in the spring of 1950, some 59–80 per cent. were parasitised by *R. dendrolimi.*

Puchkov (V. G.). **New Species of Heteroptera damaging perennial leguminous Grasses in the central Black-soil Zone.** [*In Russian.*]—*Ent. Obozr.* **32** pp. 76–81, 7 refs. Moscow, 1952.

A list is given of 19 species of Heteroptera that breed on leguminous forage crops in the central black-soil zone of European Russia, with notes on the bionomics of 12 of them based on observations by the author in 1946–50. These are the Mirids, *Euryopocoris nitidus* (Meyer), *Halticus apterus* (L.), *Brachycoleus scriptus* (F.), *Plagiognathus bipunctatus* Reut., *Chlamydatus pullus* (Reut.) and *C. pulicarius* (Fall.), the Pentatomids, *Piezodorus lituratus* (F.), *Carpocoris pudicus* (Poda), *C. pudicus fuscispinus* (Boh.). *Dolycoris baccarum* (L.) and *Palomena prasina* (L.), and the Plataspid, *Coptosoma scutellatum* (Geoffr.). All attack lucerne and most of them other plants as well. It is stated that the Mirid, *Deracocoris* (*Camptobrochis*) *punctulatus* (Fall.), which also occurs on lucerne, is more beneficial than injurious, owing to its partly predacious habits.

Milyanovskiĭ (E. S.) & Mitrofanov (P. I.). **The large Caucasian Hepialid —a new Pest of Grape Vines in Abkhazia.** [*In Russian.*]—*Ent. Obozr.* **32** pp. 82–85, 2 figs. Moscow, 1952.

Larvae of *Zenophassus* (*Phassus*) *schamyl* (Christoph) were found in June 1952 infesting the roots and root-collars of grape vines near Sukhum, on the coast of the Black Sea. This Hepialid, all stages of which are briefly described, is fairly common in the region and has repeatedly been observed in vineyards in recent years. Usually only one larva occurred per plant, but the injury was in most cases severe, as the main root was severed and the larva tunnelled in the lower part of the stem. Larvae were also found on the roots of hazel (*Corylus avellana*) and blackberry growing close to the affected vineyard. In the laboratory, larvae taken from infested plants pupated in mid-August and the adults emerged 2–3 weeks later. In the field, pupation occurred in a cocoon in the soil near the food-plant. The fertilised females flew low over the ground after sunset, scattering their eggs, and the larvae entered the soil in search of roots. There is only one generation a year.

In experiments on control, infested vines were transplanted into boxes

containing soil treated with p-dichlorobenzene at the rate of 1·4 oz. per plant or with a dust containing 12 per cent. BHC at the rate of 1 oz. per plant; all the larvae died in ten days, whereas those in untreated soil developed normally. In field tests, p-dichlorobenzene was introduced into the soil at the same rate, the dose being divided into quarters and applied at a depth of 5–8 ins. at four points 2–3 ins. from the plant. In the case of BHC, the roots of the plants were exposed to a depth of 4–5 ins. and dusted with the preparation, and it was also mixed with the soil used to cover the roots after treatment. Both insecticides killed all the larvae in eight days, but the leaves dried up on four of the ten plants treated with p-dichlorobenzene. BHC caused no plant injury and was very effective when applied in the same manner on a large scale in July. Additional tests showed that the BHC dust had no adverse effect on the vines or the flavour of the grapes, even at the high rate of 7 oz. per plant.

Belosel'skaya (Z. G.). **The Cherry Shoot Moth** (*Argyresthia ephippella* F.) **as a Pest of Cherry and Plum.** [*In Russian.*]—*Ent. Obozr.* **32** pp. 86–92, 3 figs., 9 refs. Moscow, 1952.

Argyresthia ephippella (F.), all stages of which are briefly described, is a widely distributed pest of cherry, plum and other stone fruits in the Soviet Union. Observations over several years in the Province of Leningrad showed that it has one generation a year and overwinters in the egg. The larvae hatch in the second half of May, when the bud scales of cherry and plum are beginning to separate, and enter the buds in which they feed. Both leaf and flower buds are attacked, and there is usually only one larva in each. The larval stage lasts 30–35 days, the larvae becoming full-fed when flowering is almost over. They then drop to the ground and pupate in cocoons in the upper layer of soil. In the laboratory, at a temperature of 18°C. [64·4°F.], females deposited up to 32 eggs each. The eggs are laid in cracks and crevices in rough bark near the leaf buds, or on the bud scales, but never on smooth bark. The Braconid, *Ascogaster elegans* (Nees), was reared from the larvae.

Control measures are reviewed from the literature, and recommendations are made for treatments against the overwintering eggs and the newly hatched larvae. In a test, digging the soil beneath infested trees in autumn destroyed a high proportion of the pupae.

Parfent'ev (V.Ya.). **New Data on the Crimean House Anobiid,** *Nicobium schneideri* **Reitt. (Coleoptera, Anobiidae).** [*In Russian.*]—*Ent. Obozr.* **32** pp. 93–95, 1 fig. Moscow, 1952.

The Anobiid, *Nicobium schneideri* Reitt., causes serious damage to structural timbers in houses in the Crimea. It attacks seasoned wood, chiefly spruce or pine, with a moisture content of 14–20 per cent., and commonly occurs in concealed sites subject to periodical wetting, such as the ends of beams, flooring, partitions, and window and door frames. The eggs are laid singly in cracks and crevices in the wood, particularly on cut surfaces, and hatch in 9–16 days. The larvae bore in the sapwood but leave the heartwood intact, and the damage caused may be considerable, collapse of floors and ceilings as a result of it having repeatedly been recorded. If it occurs in the same beam with *Hylotrupes bajulus* (L.), *N. schneideri* bores in the peripheral layers and *Hylotrupes* in the deeper ones. Winter is passed by the larvae, usually those half-grown but sometimes those in the later instars, and some overwinter twice, these giving

rise to the first adults of the year. Pupation occurs between the end of May and July, and the adults emerge from early June to early September. The females lay up to 30 eggs each. Examination of timbers in the attics of 22 houses showed that *N. schneideri* was usually less numerous than *H. bajulus*. The larvae and pupae were attacked by the Bethylid, *Sclerodermus domesticus* Latr., and the Pteromalid, *Lariophagus distinguendus* (Först.), which parasitises various Anobiids in the Crimea. The protective measures suggested include the use of wood preservatives and DDT dusts and sprays.

RUBTSOV (I. A.). *Lindorus*—**an effective Predator of Diaspine Scales.** [*In Russian.*]—*Ent. Obozr.* **32** pp. 96–106, 4 figs., 2 refs. Moscow, 1952.

Lindorus lophanthae (Blaisd.), all stages of which are described, was introduced from Italy into the Soviet Union in 1947 for liberation against scale insects on *Citrus* and other subtropical plants. A laboratory stock was reared from a single pair of adults at Batum, and the Coccinellid appeared able to attack all the local Diaspines, *Aspidiotus hederae* (Vall.), *Chrysomphalus dictyospermi* (Morg.), *Aonidiella aurantii* (Mask.), *Quadraspidiotus* (*Diaspidiotus*) *perniciosus* (Comst.) and *Aspidiotus destructor* Sign. being preferred. It was released in the autumn of 1947 on date palms heavily infested by *C. dictyospermi* at Batum, survived the comparatively cold winter of 1947–48, when the temperature dropped to −10°C. [14°F.], and bred vigorously in spring and summer. In 1948 and 1949, it was released at many places in western Transcaucasia and became established. The winter of 1949–50 was exceptionally cold, however, so that many subtropical plants were killed or seriously injured, and the scales and their natural enemies, including *L. lophanthae*, also apparently died out. Further liberations were subsequently made, and it is hoped that a cold-resistant race of the Coccinellid may develop.

Observations at Batum showed that the life-cycle of *L. lophanthae* was completed in about a month at 20–25°C. [68–77°F.] and in 25–26 days at 25–30°C. [77–86°F.], 25°C. being the optimum temperature. Development continued slowly throughout the winter, and all stages were present in January and February. Under favourable conditions, the adults survived for a month or longer. The females oviposited almost throughout life, laying an average of 500 eggs each, with a maximum of 800 or more. For oviposition, the female fed on the edge of the scale and the insect beneath and inserted an egg into the hollow so formed. The larvae hatched in three days and left the scales in search of food. They were very voracious and fed on the immature Coccids, whereas the adults mostly fed on the adult female scales. No parasites or diseases of the Coccinellid were observed. Investigations on the interrelations between *L. lophanthae* and parasites of the Coccids showed that in the case of *C. dictyospermi* parasitised by *Aphytis chrysomphali* (Merc.), the Coccinellid avoided parasitised individuals and attacked them only when food was scarce. Even then, they frequently left the parasites unharmed.

SKORIKOVA (O. A.). **Sawflies (Hymenoptera, Tenthredinidae) injurious to Bush Fruits—Currants and Gooseberry.** [*In Russian.*]—*Ent. Obozr.* **32** pp. 107–116, 16 refs. Moscow, 1952.

The author gives a list of 13 species of sawflies recorded from currants and gooseberry in the Soviet Union, including one described as *Nematus*

bey-bienkoi, sp.n., from females taken at Molotov in 1943–44, and states that plants of this group are also attacked by *Eriocampa dorpatica* Konow, which has not previously been recorded as a pest, and an undescribed species of *Nematus* (*Pteronidea*). A study of the food-plant relations of these insects showed that they can be classified as those that feed on black currant and in its absence on red currant, but do not infest gooseberry, and those that attack red currant and gooseberry, but not black currant. *E. dorpatica* and *N. bey-bienkoi* belong to the first group, and *Nematus* sp. and *N.* (*P.*) *ribesii* (Scop.) [*cf. R.A.E.*, A **16** 42] to the second. There are further differences in oviposition. The eggs of *Nematus* sp. were observed only on red currant, and young incompletely expanded leaves on the upper part of the plant were preferred. In tests with red currant and gooseberry in the same stage of development, eggs were laid on gooseberry, though to a less extent than on red currant. In the case of *N. ribesii*, oviposition was concentrated on fully expanded leaves in shaded positions on the lower part of the plant. The eggs of the first generation were laid on gooseberry and those of the second on red currant. *Pristiphora pallipes* Lep., which has three generations a year in the Province of Leningrad, preferred young leaves, the eggs of the first generation being laid on red and white currant, those of the second on gooseberry and currants, and those of the third on gooseberry. Good results were given by dusting against *N. ribesii* and *Nematus* sp. with 5 per cent. DDT in talc when the flower-buds of gooseberry were swelling and the leaves of red currant unfolding. Further applications should be made if infestation or injury is observed.

A key to the late-instar larvae of ten species is appended. These comprise eight of those mentioned earlier, together with *Croesus* sp. on red currant and a further unidentified species of *Nematus* (*Pteronidea*) that attacks black currant. The other stages of these two are unknown.

Nikol'skaya (M. N.). **Two new Species of Seed-eaters of the Family Eurytomidae (Hymenoptera, Chalcidoidea).** [*In Russian.*]—*Ent. Obozr.* **32** pp. 304–306, 9 figs., 2 refs. Moscow, 1952.

Descriptions are given of the adults of both sexes of *Eurytoma caraganae*, sp.n., an important pest of the seeds of *Caragana arborescens* in the Soviet Union, and of *Bruchophagus glycyrrhizae*, sp.n., which was reared from the seeds of liquorice (*Glycyrrhiza glabra*) in western Kazakhstan.

Krishnamurti (B.) & Usman (S.). **The Ragi Stem Borer, *Sesamia inferens* Walker.**—*Bull. Dep. Agric. Mysore* Ent. Ser. no. 15, [5+] iii + 70 pp., frontis., 10 pls., 1 map, 52 refs. Bangalore, 1952.

Ragi (*Eleusine coracana*) is an important food-crop in Mysore and is being intensively grown under irrigation as part of an agricultural programme for increased food production. It is being increasingly attacked by *Sesamia inferens* (Wlk.), however, which is primarily a pest of sugar-cane but infests various cereals. All stages are described in detail, and an account is given of investigations carried out over three years on its bionomics and control. The following is based on the authors' summary of the results.

The larva of *S. inferens* is a stem-borer and causes considerable damage if the food-plant is in a suitable stage of development. If the stem is well developed and hard, however, it leaves its tunnel or girdles it below a node and migrates to a fresh plant. The percentage infestation ranged from 0·83–2·58 in moderately infested fields to 5–6 in those most severely

attacked. There were four generations a year, and development was continuous. The duration of the life-cycle averaged 45·6 days in summer and 71·1 days in winter, when the larval stage was considerably prolonged. The parasites reared from field-collected material comprised *Telenomus* sp. from the eggs, *Winthemia semiberbis* Bez., *Bracon* (*Microbracon*) *chinensis* Szépl., and *Apanteles flavipes* (Cam.) from the larvae, the first two being the most important, and two unidentified species of *Xanthopimpla* from the pupae. The total percentage parasitism of the larvae was about 20. *Trichogramma minutum* Ril. parasitised the eggs in the laboratory but not in the field, where they are concealed between the leaf-sheath and the stem, and *Tetrastichus ayyari* Rohw. was found to parasitise the pupae, though with some difficulty. *B.* (*M.*) *hebetor* Say successfully parasitised the larvae in laboratory tests and was released against them in a field plot in May 1950. Initial establishment was obtained, though the numbers involved were small. Notes on the bionomics of all these parasites are included.

Systematic collection and destruction of all plants showing dead-hearts is widely practised for control. Light earthing up of the young crop is effective against the very young larvae, but does not prevent oviposition. Over 5 per cent. of the stubble harbours living larvae, so that its destruction is desirable. Steeping the seedlings for five seconds in a water suspension of DDT at 1 lb. per 16 gals. reduced the infestation by 90 per cent., and spraying the crop with the same material reduced it by 80 per cent. Both treatments remained effective for about a month. A combination of the two is promising but would be expensive. Various dusts of DDT or BHC proved ineffective, and submerging the seedlings under water in laboratory tests had little effect except on very young larvae.

Patel (G. A.) & Hadli (S. N.). **Experiments with some new Insecticides for the Control of Mango Hoppers** (*Idioscerus atkinsoni*, **Leth.**).—*Indian J. Ent.* **15** pt. 2 pp. 107–114, 27 refs. New Delhi, 1953.

The Jassids, *Idioscerus atkinsoni* Leth., *I. clypealis* Leth. and *I. niveosparsus* Leth., are among the most important pests of mango in India, and sometimes destroy a whole crop. They suck the sap from the flowers, causing them to fall and preventing fruit-setting, damage young vegetative shoots and leaves, and excrete honeydew, on which a sooty mould develops, disfiguring the remaining fruits. In Bombay State, *I. clypealis* is the injurious species in the southern coastal belt, *I. niveosparsus* occurs to the north of Bombay, and *I. atkinsoni* is widely distributed over the rest of the State and is thus the most important. The experiments described were carried out in an area in which *I. atkinsoni* predominated.

In tests in 1951, in which the Jassid population on the inflorescences was sampled just before and two days after dusting with 5 per cent. DDT mixed with sulphur (1:1, 1:2 or 1:3) in the fourth week of January, all treatments reduced nymphal populations by over 90 per cent., but the first two, which gave reductions of 97 and 95·9 per cent., were significantly better than the third. Numbers were still low but beginning to rise 15 days after dusting. In 1952, 5 per cent. DDT mixed with sulphur (1:1 and 1:2) was again very effective (over 95 per cent. reduction in two days) with no significant difference between the mixtures during the fortnight after treatment or in their effect on adults caged for 48 hours on flowers dusted up to 15 days previously. Treatment with sulphur is essential for the control of mildew, and its addition to DDT removes the risk of mite outbreaks.

Tests of other organic insecticides in 1952 showed that 5 per cent. toxaphene with sulphur (1:1) was as effective as 5 per cent. DDT with sulphur (1:1 or 1:2), whereas 5 per cent. chlordane or DDD with sulphur (1:1) was rather less effective. When tested at 2·5 per cent. without sulphur, DDT and toxaphene were again equally toxic and chlordane and DDD less so, and each of these treatments gave lower mortality than 5 per cent. of the same chemical with sulphur (1:1), sulphur itself having some toxicity to the Jassids.

Cheema (P. S.). **Nature and Extent of Damage caused by the Sugarcane Root-borer, *Emmalocera depressella* (Swin.), in the Punjab.**—*Indian J. Ent.* **15** pt. 2 pp. 139–145, 1 fig., 4 refs. New Delhi, 1953.

Emmalocera depressella (Swinh.) is the most destructive of the insects that attack the underground parts of sugar-cane in India and Pakistan. As a result of investigations in Pakistan, the author describes the method of entry of the larva and the symptoms of attack on young and mature cane. At the beginning of April, when the plants are young, the newly hatched larva crawls down and bores into the base of the shoot, about 2·5 ins. below ground level, as a result of which the central spindle begins to dry after about 17 days and the whole plant after 37–43 days. After July, the larvae attack the side tillers more frequently than the main or mature side shoots; they make 1–7 holes in the internodes below ground level and sometimes migrate from one shoot to another. Tests in which young canes were infested with larvae of the five generations in April, May, June, July and September, respectively, showed that larvae of the last generation had no apparent effect on the weight of the cane, but that the earlier ones caused varying degrees of reduction. Larvae of the first generation killed all the shoots attacked, and those of the second, third and fourth reduced the canes by 66·2, 14·3 and 5·2 per cent. in length and 73, 17 and 6·5 per cent. in weight, respectively. The percentage infestation did not indicate the actual loss caused by the borer throughout its period of attack, which comprised losses due to death of attacked shoots in April and May and to the reduction in weight of canes by attack during the subsequent period of growth; a formula is given enabling the total loss caused by the five generations to be calculated from the percentage infestation by each.

Examination of the juice from canes of four varieties showed decreases in the percentages of sucrose and total solids and in the purity coefficient in plants infested by larvae of the last four generations.

Usman (S.). **Bionomics and Control of the Tamarind Seed Borer, *Sitophilus linearis* (Herbst).**—*Indian J. Ent.* **15** pt. 2 pp. 147–156, 3 figs., 12 refs. New Delhi, 1953.

Calandra (*Sitophilus*) *linearis* (Hbst.), which occurs wherever tamarind (*Tamarindus indica*) is grown, is the commonest and most injurious pest of the stored seeds in Bangalore. Although it breeds continuously in the stored seed, infestation sometimes begins on the trees, the weevils boring through the tough shell and pulp of the ripe pods [*cf. R.A.E.*, A **9** 183]. Under the warm humid conditions of storage, breeding is rapid, with the result that practically the entire stock is destroyed in 4–6 months. *C. linearis* has been recorded in the field only from tamarind, and attempts to induce it to breed on the seeds of cereals were unsuccessful. In studies on its bionomics, the females deposited 7–63 eggs each over a period of 5–31 days in groups of 7–23 in 2–4 seeds. Unfertilised eggs did not develop.

In February–March 1952, at temperatures of 63–89°F., the larvae hatched in 2–4 days and immediately began to tunnel in the seeds. They became full-fed in 13–18 days and pupated in cells at the end of the tunnels after a prepupal period of 1–2 days. The adults emerged after 6–8 days, but remained in the cells for 2–4 days before leaving the seeds; 5–17 completed development in a single seed, and there were equal numbers of males and females. Adult life lasted 13–71 days. The weevils occur in the field for about 4–6 weeks in February and March, when the pods ripen on the trees; they are carried by wind or dispersed by crawling or flying.

Tamarind seeds are usually stored in bulk after decortication, for which they are heated to a temperature of 120–150°F. for 5–7 minutes. This kills all stages of the weevil, but does not prevent reinfestation. Systematic removal and destruction of infested seeds is advised. If the stocks are turned over and aerated periodically, the adults come to the surface and can be collected and destroyed. When storage is in bins, a two-inch layer of sand on top will trap weevils that come to the surface to pair. Fumigation with a mixture of ethylene dichloride and carbon tetrachloride (3:1) at the rate of 30 lb. per 1,000 cu. ft. space for three days gives complete mortality of all stages.

Appanna (M.) & Shivashankara Sasthry (K. S.). *Microbracon hebetor* **Say—not a natural Parasite of the Sugarcane Borers.**—*Indian J. Ent.* **15** pt. 2 pp. 159–160, 3 figs. New Delhi, 1953.

In laboratory tests in India, *Bracon* (*Microbracon*) *hebetor* Say parasitised the larvae of *Chilotraea infuscatella* (Sn.) (*Argyria sticticraspis* (Hmps.)) when these were exposed naked and those of *Scirpophaga nivella* (F.) when they were partly exposed by splitting open the sugar-cane tops, but the percentages attacked were only 5–17 and 2–13, respectively. In small-scale cage cultures, larvae of *Scirpophaga* in their natural positions were not parasitised, and those of *Chilotraea* were parasitised to a very small extent, from which it is concluded that *B. hebetor* would not control these borers in nature.

Martin (Henri). **Scale Insects on** *Citrus* **in Tripolitania.**—*FAO Plant Prot. Bull.* **2** no. 8 pp. 113–116, 2 figs. Rome, 1954.

Infestation by Coccids caused severe losses of *Citrus* in Tripolitania (Libya) in 1953 and limited fruit exports, and investigations on the species present and their control were therefore carried out. The most important were found to be *Chrysomphalus dictyospermi* (Morg.), *Parlatoria pergandei* Comst., *P. ziziphus* (Lucas) and *Lepidosaphes beckii* (Newm.) (*citricola* (Pack.)), and maps showing their local distribution are included. *C. dictyospermi* was the most widespread and injurious, being found in the area round Tripoli and on the coast to the west. It mainly attacked orange and mandarin orange, and was rare on grapefruit and lemon. Apart from two foci to the west, *P. pergandei* was restricted to the neighbourhood of Tripoli itself; it attacked orange chiefly, mandarin orange and grapefruit sometimes, and lemon rarely. *P. ziziphus* occurred only in Tripoli and its immediate environs and attacked orange chiefly, though it had also been observed on mandarin orange, grapefruit, lemon and bitter orange. *L. beckii* occurred mainly in coastal orchards to the east of Tripoli, and attacked orange, mandarin orange, grapefruit and lemon. *Coccus hesperidum* L., *Planococcus* (*Pseudococcus*) *citri* (Risso) and *Icerya purchasi* Mask. were of little importance, and the last was normally held in check by *Rodolia cardinalis* (Muls.).

In tests of sprays for the control of the four major species, 2 per cent. white-oil emulsion gave almost complete mortality of all of them (97–100 per cent.), and an emulsifiable white oil gave 99 per cent. mortality of *Chrysomphalus*, 92–94 per cent. of *Parlatoria ziziphus* and 97 per cent. of *L. beckii* at 1·5 per cent., but was unsatisfactory at 1 per cent. Parathion in a wettable-powder spray gave 18–57 and 99 per cent. mortality of *P. ziziphus* at 0·0075 and 0·015 per cent., respectively, 93–94 and 100 per cent. mortality of *L. beckii* at the same concentrations, and 78 and 87 per cent. mortality of *P. pergandei* at 0·015 and 0·03 per cent. When 0·02 per cent. parathion was added to the 2 per cent. white-oil spray, the percentage mortality of *P. ziziphus*, *P. pergandei* and *L. beckii* was 99–100. It is recommended that 2 per cent. white oil should be applied alone against *C. dictyospermi* and with the addition of 0·02 per cent. parathion against *Parlatoria* and *Lepidosaphes*. A first application should be made before flowering or when the fruits are still small, and a second 3–4 weeks later if infestation is heavy.

Outbreaks and new Records.—*FAO Plant Prot. Bull.* **2** no. 8 pp. 121–122. Rome, 1954.

R. J. V. Joyce reports (p. 122) that rice grown on a small scale in the southern Sudan in 1953 was attacked by *Pachydiplosis oryzae* (Wood-Mason), which has not previously been recorded from that country.

It is reported from the U.S. Department of Agriculture (p. 122) that *Vinsonia stellifera* (Westw.) was taken on orchid leaves near Miami in September 1953. Since this Coccid is known to attack several plants of economic importance in Florida, measures were immediately taken for its eradication. The weevil, *Eucoptus depressus* Woll., was taken recently on coconut in Miami. Both these insects are recorded for the first time from Florida and, as far as could be determined, from the United States.

Adel Abou Nasser. **Notes on some Insect Pests in Lebanon.**—*FAO Plant Prot. Bull.* **2** no. 9 pp. 138–139. Rome, 1954.

Ceratitis capitata (Wied.) is the most destructive and widespread insect pest in Lebanon, where it attacks all species of *Citrus* and many deciduous fruits. It has 7–8 generations a year on the coast, where damage is especially severe on late oranges, and 5–6 in the mountain regions. On the coast, the adults appear in early May in the south and late May in the north, and the duration of life of adults reared on orange in the south was 15–22 days in August and 34–45 days in September–November. The optimum temperatures for development ranged from 13 to 24°C. [55·4 to 75·2°F.]. Examination of punctured oranges on 3rd and 26th August and 15th and 28th October showed that the percentages containing living larvae were 3, 14, 24 and 29, respectively. An arsenical bait-spray, applied 6–7 times at intervals of 7–8 days from the time that the adults appear, gives fairly good protection.

Citrus is also attacked by *Phyllocoptruta oleivora* (Ashm.), which was first recorded in the coastal region of Lebanon about 1933–34. This mite infests the fruits, young leaves and terminal buds and reproduces parthenogenetically from June to August, development ceasing in January and February. On the coast the egg, larval and nymphal stages last 2–5, 1–3 and 1½–3 days, respectively, in summer, and the larval and nymphal stages 4–7 and 5–13 days in winter. The number of generations a year is not known, but a new generation usually appears every 7–11 days in summer and 16–18 days in winter. Sprays of lime-sulphur or white oil have given effective control.

Munro (J. A.). **Entomology Problems in Bolivia.**—*FAO Plant Prot. Bull.* **2** no. 7 pp. 97–101, 2 figs. Rome, 1954. **A supplemental Note to "Entomology Problems in Bolivia".**—*T. c.* no. 10 p. 150, 2 refs.

The first of these papers comprises a review of important insect pests of crops and their control in Bolivia, and corrections to a few of the scientific names used are made in the supplemental note. Potatoes, which are grown in the mountain valleys and on the western high plains, are attacked by the larvae of *Premnotrypes* spp., the main species near Lake Titicaca being *P. latithorax* (Pierce). Up to 20 or more feed in a single tuber, and when one is consumed, they migrate to another. Other pests of the tubers include cutworms (of which the most injurious is *Copitarsia consueta* (Wlk.)), *Hylemyia cilicrura* (Rond.) and *Gnorimoschema operculella* (Zell.). The leaves are damaged by *G. operculella*, *Frankliniella tuberosi* Moult., and unidentified species of *Epitrix*, *Empoasca* and *Epicauta*. Pests that damage the tubers are controlled by applying 2·5 per cent. aldrin or 5 per cent. chlordane at about 40 lb. per acre to the crowns of young plants a few inches high just before hilling, and repeating in mid-season if necessary. Sprays of DDT or aldrin, alone or with fungicides, are used to protect the foliage. *Amblyteles* spp. parasitised 16 per cent. of the pupae of *Copitarsia* spp. in 1952, but were scarce in 1953. Another parasite of cutworms, *Meteorus chilensis* Porter, was commonly reared from infested tubers in 1952.

Sugar-cane is infested by *Metamasius bilobus* Hust., which appears to be most abundant in abnormally wet seasons and damaged 30 per cent. of the canes in 1952 and 10 per cent. in 1953. The Tachinid, *Ceromasia* (*Microceromasia*) *sphenophori* (Villen.), was introduced from Hawaii and released in an infested field in April 1953 to ascertain whether it would attack this borer. Other sugar-cane borers include *Diatraea rufescens* Box, *D. saccharalis* (F.) and *D. dyari* Box, and *Paratheresia claripalpis* (Wulp), which is known to parasitise *D. rufescens*, is present. The canes are also infested by *Saccharicoccus* (*Trionymus*) *sacchari* (Ckll.) and *Tomaspis spectabilis* Dist., the latter being most injurious near fields of elephant grass (*Pennisetum purpureum*), which is particularly susceptible to this Cercopid.

Cotton is not grown extensively but is attacked by *Platyedra* (*Pectinophora*) *gossypiella* (Saund.), which was recorded from Bolivia in 1951, *Alabama argillacea* (Hb.), *Aphis gossypii* Glov. and *Dysdercus* spp., and terminal injury to the stems resembling that caused in other parts of South America by *Chalcodermus* spp. has been observed. About 65 per cent. of the crop was damaged by these and other pests in the larger plantings in 1952, largely because effective control measures are not applied. The damage typical of *Chalcodermus* also occurs on *Hibiscus cannabinus*, a fibre plant recently introduced into Bolivia.

Lepidosaphes beckii (Newm.), *L. gloverii* (Pack.), *Selenaspidus articulatus* (Morg.), *Coccus viridis* (Green) and *Icerya purchasi* Mask. are the most widespread pests of *Citrus* and other fruits, though *I. purchasi* is largely controlled by *Rodolia cardinalis* (Muls.) in the localities into which this beetle has been introduced. *Heliothrips haemorrhoidalis* (Bch.) appears to be widespread on *Citrus*, and though the Aphids, *Toxoptera aurantii* (Boy.), *Aphis spiraecola* Patch and *A. gossypii* are also prevalent, they are controlled by natural enemies. *Anastrepha fraterculus* (Wied.) and *Ceratitis capitata* (Wied.) cause severe damage to *Citrus* and other fruits, and Opiine Braconids that parasitise fruit-flies were introduced from Hawaii in September 1953 and released in a heavily infested area. *Bryobia praetiosa* Koch and *Eriophyes pyri* (Pgst.) cause considerable damage to pear, 80 per cent. of

the fruits being deformed in 1952, though injury was less severe in 1953. *Strategus jugurtha* Burm. injured about 25 per cent. of pineapple plants grown commercially near dense woods by feeding in the centre of the main stalk. Lucerne near Cochabamba was attacked by *Tetranychus desertorum* Banks and *Cuerna centrolinea* Melich. in 1953, and rice and maize were injured by *Laphygma frugiperda* (S. & A.) and *Mocis latipes* (Gn.). Leaf-cutting ants cause severe damage to *Citrus* and field crops over two-thirds of the country, *Atta lacvigata lizeri* Santschi predominating in the east, *A. scxdens rubropilosa* Forel in the centre and *A. s. fuscata* Santschi in the north-west. Good results have been given by the application of chlordane, aldrin or dieldrin to the entrance and exit holes of the nests.

Thompson (W. R.). **The Tachinid Parasites of** *Archips cerasivorana* **Fitch.** (**1**) *Dichaetoneura leucoptera* **Johns.** (**Diptera**).—*Canad. Ent.* **85** no. 1 pp. 19–30, 20 figs., 16 refs. Ottawa, 1953. **Note on** *Dichaetoncura leucoptera* **Johns. (Diptera, Tachinidae).**—*T. c.* no. 10 pp. 391–392, 1 fig. **The Tachinid Parasites of** *Archips cerasivorana* **Fitch.** (**2**) *Eusisyropa blanda* **O.S.** (**Diptera**).—*T. c.* no. 11 pp. 393–404, 19 figs.

The first of these papers on the Tachinid parasites of *Tortrix* (*Archips*) *cerasivorana* (Fitch), which commonly feeds on choke-cherry [*Prunus virginiana*], but occasionally attacks cultivated cherry, in Canada and the United States, opens with a critical review of the species listed from this host in a catalogue already noticed [*R.A.E.*, A **33** 128] and keys to the adults and puparia of the four species recognised by the author as parasites of it. These are *Dichaetoneura leucoptera* Johnson, *Phorocera tortricis* Coq., *Nemorilla pyste* (Wlk.) and *Zenillia blanda* (O. S.), Baird's record of *Z.* (*Exorista*) *boarmiae* (Coq.) [**6** 507] being based on mis-identification of *Z. blanda* and Hoffmann's record of *Schizocerophaga leibyi* Tns. [**25** 251] probably applying to a sawfly host. *N. pyste* is the species recorded from *T. cerasivorana* by the latter author in the United States as *N. maculosa* (Mg.) [**25** 251].

The main part of the paper comprises descriptions of the larvae, puparium and reproductive systems of both sexes of *D. leucoptera*, a discussion of its systematic relations, in which it is agreed that *Dichaetoncura* is distinct from *Phytomyptera*, and notes on its bionomics. Its seasonal history is not known, but it probably overwinters in the larva of an alternative host [*cf.* **6** 507]. In addition to *D. leucoptera*, it has been recorded from *Depressaria heracliana* (L.), the larvae of which are present at the same time as those of *T. cerasivorana*, and *Eucosma* (*Epiblema*) *strenuana* (Wlk.), the larvae of which bore in *Ambrosia trifida* and *A. artemisifolia*. In a discussion of the situation of the larvae in the host, the author states that all those examined occupied integumental funnels opening on the last segment, and adds in the second paper that examination of further parasitised larvae of *T. cerasivorana* showed that all the parasites were in the hind intestine, which confirms a previous finding by R. W. Smith for this species in *D. heracliana*. This is the first record of Tachinid larvae in this position.

The third paper contains similar information for *Zenillia* (*Eusisyropa*) *blanda*, with a description of the microtype egg. The eggs of this species are deposited, probably in groups, on the leaves of the food-plant of the host and are ingested by the latter. The first-instar larvae appear to be attached for a time to the wall of the mid-intestine of the host.

Eidt (D. C.). **European Wireworms in Canada with particular Reference to Nova Scotian Infestations.**—*Canad. Ent.* **85** no. 11 pp. 408–414, 1 map, 12 refs. Ottawa, 1953.

European Elaterids were not known to be present in Canada until June 1939, when an adult of *Agriotes sputator* (L.) was found in beach drift in New Brunswick. Subsequent examination of museum collections showed the presence of another European species, *A. obscurus* (L.), which had been collected many years previously in Nova Scotia and misidentified as the native *A. mancus* (Say). A third, *A. lineatus* (L.), was collected in Nova Scotia in 1947 and in Newfoundland in 1949. Surveys of the distribution of the three species showed that *A. obscurus* is present in five districts of Nova Scotia, *A. lineatus* in one of these, and *A. sputator* in two of them and one other. *A. obscurus* also occurs at two places in British Columbia, in one of which *A. lineatus* is present. In Nova Scotia, all three species are restricted to small areas near old ports, and they are thought to have been introduced in sand or soil ballast deposited on the shore by ships returning from Europe. Their spread from these areas has been prevented by the surrounding forests, and they are not present on the isthmus joining Nova Scotia to the mainland. *A. obscurus* has penetrated farther inland than the other two. *A. mancus* did not usually occur in the presence of the introduced species. *A. sputator* caused some damage to crops in two areas, and *A. lineatus* was so injurious to potatoes in another that the commercial cultivation of the crop was discontinued. *A. obscurus* was found with larger numbers of *A. mancus* in a seriously damaged field of tomatos and another of oats. In view of the geographical isolation of the introduced species and the reported inability of the adults to fly, there is no immediate risk of these wireworms becoming widely distributed on the continent.

Harcourt (D. G.). **Note on Injury to Cucumber by the Tarnished Plant Bug, *Lygus lineolaris* P. de B. (Hemiptera: Miridae).**—*Canad. Ent.* **85** no. 11 p. 421, 1 fig., 1 ref. Ottawa, 1953.

Adults of *Lygus lineolaris* (P. de B.) became numerous in a field of young cucumber plants in Ontario in July 1952, and fed voraciously on the young terminal growth. The feeding injury, comprising irregular holes, without necrotic margins, that became apparent as the leaves expanded, resembled that caused by *Acalymma vittata* (F.).

MacGillivray (M. E.) & Spicer (P. B.). **Aphid Parasites collected in New Brunswick in 1950.**—*Canad. Ent.* **85** no. 11 pp. 423–431, 2 refs. Ottawa, 1953.

A list is given of some 40 Hymenopterous parasites reared from Aphids collected on potato and other plants in New Brunswick in 1950 showing the hosts and their food-plants, and another of the Aphid hosts with the parasites reared from each.

Kelly (J.) & Falkenstein (W.). **Effect of Pesticides on Application Equipment.**—*Agric. Chem.* **9** no. 11 pp. 39–41, 124–125, 127, 2 figs., 4 refs. Baltimore, Md., 1954.

The extensive use of halogenated-hydrocarbon insecticides and other chemicals for agricultural purposes has created problems of equipment

deterioration. Enquiry among United States manufacturers showed that dusts gave little serious trouble, but that liquid formulations were liable to cause injury, particularly to the tanks of sprayers. Corrosion of metal tanks may be due to natural causes, lack of normal precautions in use, difficulties in draining or cleaning resulting from faulty design, or the chemicals used. A simple laboratory apparatus for assessing the corrosion rates of spray liquids is described. Protective coatings for tank interiors are being increasingly investigated. Deterioration of rubber hoses and gaskets became a serious problem with the use of highly aromatic solvents in emulsion concentrates of DDT and other chemicals, but metal, leather, asbestos and some synthetic materials have been used instead of rubber with satisfactory results. Abrasion of pumps and other mechanical parts occurs with wettable powders and, in the case of organic toxicants, is generally due to the diluent used; it is necessary to balance the need for small particle size, absorbency, pH and other properties against the risk of abrasion. Owing to the high solvent action of certain formulations, spilling of small quantities removes the paint from the outside of the tank, permitting rusting, but tests of various paints showed that some resist attack by most of the agricultural formulations used.

Haynes (H. L.), Guest (H. R.), Stansbury (H. A.), Sousa (A. A.) & Borash (A. J.). **Cyclethrin, a new Insecticide of the Pyrethrins-type.** —*Contr. Boyce Thompson Inst.* **18** no. 1 pp. 1–16, 1 graph, 8 refs. Yonkers, N.Y., 1954.

A new insecticide, cyclethrin, was synthesised by esterification of *dl-cis* and *trans* chrysanthemic acid (chrysanthemummonocarboxylic acid) with *dl*-2-(2-cyclopentenyl)-3-methyl-2-cyclopenten-4-ol-1-one. The product (3-(2-cyclopentenyl)-2-methyl-4-oxo-2-cyclopentenyl chrysanthemate) differs from allethrin only in the substitution of the cyclopentenyl group for the allyl chain [*cf. R.A.E.*, A **41** 2] and like allethrin, is a mixture of eight possible stereoisomers [B **40** 116]. Its toxicity to mammals was no greater, and in some cases much less, than that of pyrethrins. An account is given of experiments on its effectiveness against various insects, in which it was compared with pyrethrins (standard 20 per cent. concentrates in petroleum distillate) and commercial-grade allethrin of 75–88 per cent. purity. Two synergists, piperonyl butoxide and sulfoxide (1,2-methylenedioxy-4-(2-(octylsulphinyl)propyl)benzene), were used in most of the tests, as one of the disadvantages of allethrin is that synergists are not so effective with it as they are with pyrethrins.

The results of experiments in which the three insecticides were tested against *Musca domestica* L. and *Blattella germanica* (L.), which are noticed in more detail elsewhere [B **43** 56], indicated that cyclethrin was about as effective as allethrin against the flies and less effective against the cockroaches when they were used without synergists. When synergists were used with all three insecticides, cyclethrin was more effective than allethrin with either synergist against the flies and with sulfoxide against the cockroaches. The test against the flies indicated that about 1·6–1·8 times as much cyclethrin as pyrethrins was required for equal performance when synergists were used with both.

Aqueous sprays, prepared by emulsifying oil concentrates of the insecticides, were tested against *Aphis fabae* Scop. on nasturtium and third-instar larvae of *Epilachna varivestis* Muls., and adults of *Tetranychus* on artificially infested beans. The mites and Aphids were sprayed on the plants, but the larvae of *E. varivestis* were placed on leaves that had been thoroughly wetted with spray an hour before. Estimates of mortality were

made 48, 24 and 72 hours, respectively, after spraying. The concentrations of pyrethrins, cyclethrin and allethrin required to give 95 per cent. mortality without synergists were 0·35, 2·5 and 5·2 per cent., respectively, for *A. fabae*, 9·2, 29 and 27 per cent. for *Tetranychus*, and 3·2, 6·6 and 5·2 per cent. for *E. variegatis*. When synergists were used with them, cyclethrin was superior to allethrin against these pests.

In tests with impregnated dusts as grain protectants [*cf.* A **42** 151, 307], adults of *Calandra* (*Sitophilus*) *oryzae* (L.) were placed in jars containing 2 oz. treated wheat and mortality recorded after seven days. Cyclethrin was equal to allethrin when both were used in dusts with or without synergists. When they were used at 0·1 per cent. with 1·6 per cent. synergist, the quantities in mg. of formulated dust required to give 50 and (in brackets) 95 per cent. mortality were 64 (130) and 58 (130) for cyclethrin with piperonyl butoxide and sulfoxide, respectively, and 64 (140) and 60 (170) for allethrin with the same synergists, as compared with 55 (150) for 0·08 per cent. pyrethrins with 1·1 per cent. piperonyl butoxide.

Storrs (E. E.) & Burchfield (H. P.). **Joint Action of binary Mixtures of Insecticides.**—*Contr. Boyce Thompson Inst.* **18** no. 1 pp. 69–78, 5 graphs, 8 refs. Yonkers, N.Y., 1954.

A procedure is described for demonstrating similar joint action and independent joint action of insecticides in mixtures [*cf. R.A.E.*, A **28** 199], based on the time required to immobilise larvae of *Aëdes aegypti* (L.) by a test technique already noticed [**42** 76, 264; **43** 36]. When the composition of a mixture at constant total concentration is plotted against T50 (time required to immobilise 50 per cent. of the larvae), the curve (viewed from above) is convex for independent joint action and concave for similar joint action. The hypothetical curves for completely similar and independent joint action are given on a graph. Actual curves that fell below or rose above them would show synergism or antagonism. Use of these criteria indicated that mixtures of DDT with p,p′methoxy-DDT (methoxychlor), chlordane with heptachlor, and aldrin with dieldrin exhibit similar joint action, whereas mixtures of DDT with heptachlor, chlordane or aldrin and of methoxy-DDT with heptachlor or chlordane show independent joint action. A mixture of aldrin and helptachlor gave an indeterminate curve, which was expected, as the toxicity of each of these materials persists well on dilution, and parathion mixed with other insecticides gave somewhat anomalous results, showing similar joint action with the related malathion and the unrelated DDT and heptachlor, and independent joint action with methoxy-DDT and aldrin. These inconsistencies may have been caused by separate but similar reactions within the same system.

Burchfield (H. P.) & Wilcoxon (F.). **Comparison of Dosage-response and Time-response Methods for assessing the joint Action of Anti-metabolites.**—*Contr. Boyce Thompson Inst.* **18** no. 1 pp. 79–82, 3 graphs, 2 refs. Yonkers, N.Y., 1954.

A method for assaying the joint action of binary mixtures based on the time required to immobilise larvae of *Aëdes aegypti* (L.) [*cf.* preceding abstract] is compared with one based on the dose required to kill a certain proportion of insects or inhibit the germination of fungus spores. In the latter, the test organisms are treated in dosage series with the two pure compounds and mixtures of them, the median lethal doses are determined graphically, and their reciprocals are plotted against the composition of the

mixtures. A straight line represents similar joint action, a curve that lies above the predicted line indicates synergism, and one falling below it represents independent joint action or, in extreme cases, antagonism. If the time required to immobilise 50 per cent. of the mosquito larvae were inversely proportional to concentration, the curves obtained by the two methods would be essentially equivalent, but the relation between concentration and time is generally less simple.

Schäfer (R.) & Becker (H.). **Über die Tätigkeit des Dorsalgefässes bei *Aphis sambuci* L. nach Begiftung mit verschiedenen Insektiziden.** [On the Activity of the Dorsal Vessel of *A. sambuci* following Poisoning with various Insecticides.]—*Z. PflKrankh.* **60** pt. 7 pp. 348–354, 1 graph, 11 refs. Ludwigsburg, 1953. (With a Summary in English.)

In the laboratory investigations described, apterae of *Aphis sambuci* L. on twigs of *Sambucus nigra* were sprayed with normal concentrations of various proprietary preparations containing parathion, toxaphene, γ BHC, DDT or the systemic insecticides, Pestox 3 [which contains schradan] and Systox [diethyl 2-(ethylmercapto)ethyl thiophosphate], or taken from the plants and placed in contact with deposits from them or from 1 per cent. solutions of pure γ BHC or DDT in acetone, and the subsequent activity of the dorsal vessel was observed. In untreated examples at 19–20°C. [66·2–68°F.], the rate of heart beat was remarkably constant and averaged 86 per minute, though there were frequent cessations of activity. After exposure to pure DDT, the pulsations became less frequent at first and then grew faster and weaker as symptoms of poisoning appeared, becoming extremely rapid in the tremor stage. Activity then declined, but continued weakly for some time after paralysis had set in. Except for the systemic insecticides, the other materials caused similar effects. On exposure to Systox, the frequency of pulsation fell initially, and though it then rose somewhat, it did not regain its normal rate, and Pestox 3, which is known to have little contact effect, caused little or no departure from the normal rate.

The findings are discussed and compared with those in the literature, mainly that on the mechanism of action of DDT. Since this is a nerve poison, the fact that the results obtained with Aphids were at variance with those recorded for cockroaches [*R.A.E.*, A **40** 160] and other insects is attributed to differences in the histology of the nerve structures of the dorsal vessels, about which little is known.

Jochum (F.). **Der Wasserhaushalt bei durch Diäthyl-p-nitrophenyl-thiophosphat (E 605) erkrankten Insekten.** [The Water Content of Insects poisoned with Parathion (E 605).]—*Z. PflKrankh.* **60** pt. 7 pp. 354–356, 11 refs. Ludwigsburg, 1953.

Laboratory experiments with various insects showed that treatment with parathion caused the haemolymph to enter the digestive tract and some of it to be ejected through the mouth. At the same time, qualitative changes occurred in the haemolymph remaining in the body cavity. Symptoms of poisoning were not shown until after the displacement of the haemolymph had begun, and since death could be delayed by mechanically preventing the loss of body fluid, it is concluded that the symptoms associated with parathion poisoning result from changes in the quantity and quality of the haemolymph and not from any direct action on nerve tissues.

Grison (P.) & Le Berre (J. R.). **Quelques conséquences physiologiques de l'inanition chez l'imago de** *Leptinotarsa decemlincata* **Say (Col. Chrysomelides).**—*Rev. Path. vég.* **32** fasc. 2 pp. 73–86, 7 figs., 36 refs. Paris, 1953.

In investigations on the effects of total or partial fasting on overwintered adults of *Leptinotarsa decemlincata* (Say) after their emergence from the soil in spring, males survived for 1–69 days, with an average of 21·4, and females for 1–72 days, with an average of 26·1, when the two sexes were kept separately at 18–20°C. [64·4–68°F.] and a relative humidity of 40–60 per cent. and water only was provided. Males and females kept separately in groups of five at 18–20°C. and 30 per cent. relative humidity survived for 14–55 and 13–55 days, with averages of 30·3 and 33·1 days, respectively. In tests at different temperatures and humidities, in which comparisons were made between adults provided with adequate food, with insufficient food or with water only or kept without food or water, adults kept in groups of five of the same sex usually survived longer than individuals that were isolated under the same conditions; the survival period was in general shorter at 30°C. [86°F.] and longer at 15°C. [59°F.] than at 18–20°C. The effect of humidity on length of life was less clear, but high relative humidity favoured survival. A graph is given showing the changes in average weights of adults in the various groups.

The effect of fasting on the capacity for flight of adults newly emerged from the soil was observed by exposing to infra-red rays, for 30 minutes daily, a group that was provided with potato leaves and another that received no food but was sprayed daily with water, both groups being normally kept at 25°C. [77°F.] and a relative humidity of 70 per cent. There was little difference in flight activity for the first ten days, but it then fell rapidly in the second group and ceased by the 23rd day; all the insects in this group were dead by the 25th day. Mortality in the first group reached only 12·5 per cent. in 40 days, and flight was still continuing at the end of that period.

Studies on the glycogen content of the fat-body showed that there is a relation between the amount of glycogen present and the capacity for flight. The reserves accumulated during the period of maturation feeding are quickly used up after the resumption of activity in spring, and if not replaced, are insufficient to permit flight in some individuals for more than nine days.

In investigations on fecundity, groups of nine females were allowed to feed for eight days, after which food was provided daily, three times a week or once a week for 33 days. The total numbers of eggs laid by the three groups were 862, 8 and 3, respectively. When food was given to females that had fasted for a month, they laid 211 eggs each and survived for 63·5 days on the average, as compared with 190 eggs and 54 days for females that had not fasted. In many cases, both males and females that were not provided with food until five or ten days after emergence from the soil survived longer than those that fed immediately.

Dadant (R.). **Contribution à l'étude de** *Oospora citri-aurantii* **Ferraris parasite des agrumes en Nouvelle-Calédonie.**—*Rev. Path. vég.* **32** fasc. 2 pp. 87–92, 1 fig., 10 refs. Paris, 1953.

Fruit rot caused by *Oospora citri-aurantii* has caused losses of up to 95 per cent. of the oranges and mandarin oranges grown in New Caledonia in recent years. The fungus is carried from one fruit to another by the fruit-piercing moth, *Othreis fullonia* (Cl.) [*cf. R.A.E.*, A **28** 462], and though

attack by it is common in the absence of *O. fullonia*, damage is not widespread unless the moth is present. It can be limited only by controlling the moth, and it is suggested that systemic insecticides may be of use for this purpose. Information on the cultural, microscopic and biochemical characters of the fungus is included.

Birch (L. C.). **Experiments on the relative Abundance of two Sibling Species of Grain Weevils.**—*Aust. J. Zool.* **2** no. 1 pp. 66–74, 1 graph, 7 refs. Melbourne, 1954.

The following is largely based on the author's summary. The small and large strains of *Calandra oryzae* (L.) [*cf. R.A.E.*, A **34** 21–22] do not interbreed and are to be regarded as sibling species. The former is common in stored wheat in Australia but has not been recorded in stored maize, whereas the converse is true of the latter, although both can be reared on either medium. Laboratory tests on the cause of the difference showed that females of either strain laid most eggs in wheat when offered both media, but the proportion in wheat was larger for the small strain than for the large one. Females of either strain tended to lay more eggs in that medium, whether wheat or maize, in which the stock from which they originated had been reared for several generations than in the other. The innate capacity for increase [*cf.* **38** 91] was greater for the small than for the large strain in wheat, and for the large than for the small strain in maize. In crowded cultures, the small strain developed the larger maximum populations in wheat and the large strain in maize; when both were present, the large strain died out (in 46–95 weeks) in wheat and the small strain (in 74–150 weeks) in maize. These differences alone, however, cannot account for the observed segregation of the two strains in stored grain.

Common (I. F. B.). **The Australian Armyworms of the Genus** *Persectania* **(Lepidoptera: Noctuidae).**—*Aust. J. Zool.* **2** no. 1 pp. 86–99, 1 pl., 4 figs., 10 refs. Melbourne, 1954.

Persectania ewingii (Westw.) has been recorded as a pest of pastures and cereal crops in many parts of southern Australia, but information on its ecology in Western Australia and in Tasmania was conflicting. A critical examination of Australian specimens showed that two species were involved, the true *P. ewingii*, of which *P.* (*Chloantha*) *composita* (Gn.) is a synonym, and one for which the name *P. dyscrita*, sp. n., is proposed. Both species are described from adults of both sexes, including the genitalia, and characters differentiating them are given. Both are recorded from New South Wales, the Capital Territory, Victoria, South Australia and Western Australia, *P. ewingii* also from Tasmania (its type locality) and *P. dyscrita* from Queensland.

The larvae of *P. ewingii* normally feed on grasses, and several outbreaks occurred on the mainland and in Tasmania in 1952. In New South Wales, annual winter grasses, including *Hordeum leporinum*, were destroyed over considerable areas in August. The adults emerged in early October and reached peak numbers in late October and early November. Outbreaks in southern Victoria and Tasmania in December, in which *Pseudaletia australis* Franclemont was also involved, may have resulted from migration of moths from further north. Extensive outbreaks in South Australia in the late winter may also have been due to *Persectania ewingii*. This species has not been collected from the wheat belt of south-western Australia, although it is present in the coastal area there. *P. dyscrita* occurs more commonly

in inland areas with a low summer rainfall. Outbreaks apparently occur in New South Wales, and outbreaks in the wheat belt of Western Australia reported by Newman [*R.A.E.*, A **15** 639] were probably due to this species. The adults were then stated to be present in autumn, but they have frequently been recorded in Western Australia in spring. They were present at Canberra from late September to early December and from February to April. When *P. dyscrita* was reared in a heated greenhouse, some evidence was obtained that it can aestivate for several weeks in the prepupal stage.

P. ewingii has also been recorded from New Zealand [*cf.* **36** 244], but examination of specimens showed that a distinct species is concerned, for which the name *P. aversa* (Wlk.) should be used. The genus *Persectania* is restricted to this and the two Australian species.

Ushatinskaya (R. S.). **Food Reserves in the Gut of the Noxious Little Tortoise (*Eurygaster integriceps* Put.) during the Period of Quiescence and their biological Importance.** [*In Russian.*]—*Dokl. Akad. Nauk SSSR* (N.S.) **93** no. 4 pp. 737–740, 2 graphs, 5 refs. Moscow, 1953.

The adults of *Eurygaster integriceps* Put. feed on the ears of cereals before flying to their hibernation quarters, and it has been observed in the Soviet Union that the amount of food in the mid-gut is considerable in winters preceding years of outbreak and much less in those preceding years of regression. Observations were carried out in the region of Krasnodar in 1951–52 on the use and significance of these reserves. They were composed of proteins, carbohydrates and a small amount of fat, with about 50 per cent. water, and the proportions of these ingredients did not alter significantly during the winter. Some of the food was used up during hibernation, but males and females still contained 60 and 76 per cent. of the original amount, respectively, at the time of the spring resumption of activity. The greater depletion of food reserves in the males is attributed to the absence of a sexual diapause such as occurs in the females, which cease to produce eggs during winter. Further depletion took place during the early stages of feeding, but it was observed that consumption of reserves was gradual, these being mixed with the fresh green food. It is concluded that they not only serve for nutrition during the winter, but also provide a source of proteins and carbohydrates during the spring period of sexual activity, when weather is often adverse and plant food of high water content and low nutritional value.

Wright (D. W.). **The Control of Cabbage Root Fly on Cauliflower Plants raised in Pots.**—*4th Rep. nat. Veg. Res. Sta. 1952–53* pp. 21–26, 1 ref. Wellesbourne, 1954.

Although cauliflower plants raised in pots in England do not become seriously damaged by the cabbage root fly [*Hylemyia brassicae* (Bch.)] when transplanted in March or earlier, those transplanted later suffer considerably. Tests were therefore carried out in 1952–53 on the effectiveness of protective treatment with liquid insecticides applied to the plants in the pots shortly before transplanting or in the field after it [*cf. R.A.E.*, A **43** 97]. The liquids were usually applied at the rate of 1/16 pint per plant. In 1952, plants receiving 0·02 per cent. γ BHC as a suspension or 0·2 per cent. chlordane in an emulsion at this rate on 3rd April, the day before transplanting, suffered little attack and made vigorous and even growth, whereas those receiving γ BHC at half the concentration

were much less adequately protected and those not treated showed stunting, with 27 per cent. of the roots severely damaged and only 11 per cent. uninjured at harvest.

In 1953, treatment with 0·02 or 0·04 per cent. γ BHC in the suspension or 0·2 per cent. chlordane in the emulsion at the usual rate or 0·06 per cent. γ BHC at half of it before transplanting, or 0·02 per cent. γ BHC at twice the rate after transplanting, resulted in uniform and vigorous growth, with significant increases in the number and weight of marketable heads and no plants killed by *Hylemyia*, whereas over 12 per cent. of the untreated ones were killed by the fly and many others stunted. In one test, 0·04 per cent. γ BHC was applied with a watering can at the rate of 2 gals. per 230 plants to pots arranged close together, so that each plant received about the standard amount. Control was as good as treatment with a measured quantity. Treatment in the field resulted in the highest yield, followed by pot treatment with chlordane and with 0·02 per cent. γ BHC, which gave a significantly greater yield than the higher concentration, despite less control of *Hylemyia*. It was considered possible that the higher dosage affected plant growth in the pots, though similar amounts had no adverse effect in the field, but in further tests in which potted plants were allowed to wilt before and after receiving 0·02, 0·04 or 0·06 per cent. γ BHC or 0·2 per cent. chlordane at the usual rate or 0·06 per cent. γ BHC at half of it, all made a good recovery and grew normally when transplanted and subsequently showed a high level of *Hylemyia* control.

An emulsion containing 0·05 per cent. aldrin, applied at the usual rate to plants in pots, also gave very good protection. No tests were made with plants grown in soil blocks but the same treatment would probably be effective.

Smirnoff (W.). **Les *Pharoscymnus* (Col. Coccinellidae) d'Afrique du nord prédateurs de *Parlatoria blanchardi* Targ.**—*Rev. Path. vég.* **32** fasc. 3 pp. 143–160, 59 figs., 15 refs. Paris, 1953.

Coccinellids of the genus *Pharoscymnus* are important predators of *Parlatoria blanchardii* (Targ.) on date palms in the oases of Algeria, Tunisia and Morocco. Since little was known of their classification, the author studied material in his own collections and those of other workers and here gives characters distinguishing *Pharoscymnus* from *Scymnus*, descriptions of the various species and forms that he recognises, with a key to the adults, and notes on their local distribution and bionomics. The species concerned are *P. numidicus* (Pic), *P. ovoideus* Sicard and *P. setulosus* (Chevr.); they were present in all three countries, and the first two were the most important.

In Morocco, the females of *P. numidicus* oviposited in March on the fibres on the stems of the palms, and eggs were observed in groups of up to 28. The egg stage averaged 4–6 days in May, and the larval and pupal stages lasted 2–3 weeks and 5–7 days, respectively, complete development requiring 25–35 days in spring. Larvae were most abundant in May and June, decreased in number in July and August, and were common again in October. Third-instar larvae and pupae predominated in November, and the adults overwintered in the fibres on the palms until March. The larvae and adults moved slowly about the trees destroying whole colonies of *Parlatoria*, and were sometimes extremely numerous. The species was represented by subsp. *unicolor*, n., in dry regions on the southern limit of its distribution.

Pharoscymnus setulosus had similar bionomics, with up to five generations a year. It was much less common than *P. numidicus*, though fairly

numerous in some oases from which the latter was absent. It was observed on one occasion in Morocco attacking *Chrysomphalus dictyospermi* (Morg.) on *Citrus*. *P. setulosus* var. *anchorago* (Fairm.) was not common, and earlier records of it as an active predator of *Parlatoria* [*cf. R.A.E.*, A **22** 710, etc.] may have resulted from misidentification.

Pharoscymnus ovoideus was widely distributed and was represented by the dark var. *guttatus* Sicard in the more humid oases of Tunis and by the light var. *deserti* Sicard in the Saharan oases of Algeria and Morocco. The typical colour form of *P. ovoideus* was rare, most of the examples observed belonging to a form superficially resembling *P. setulosus* var. *anchorago*, and the name *hamifer*, n., is proposed for it. After overwintering, the females of *P. ovoideus* oviposited in March or early April on fibres on the stems of the palms; the egg stage lasted 5–8 days, the three larval instars 3–4, 2–5 and 5–7 days, respectively, and the pupal stage 6–8 days, and there were 5–6 generations a year. *P. ovoideus* is more mobile than *P. numidicus* and destroys the Coccids at random. It was abundant in very dry, light and hot localities.

The larvae of *P. numidicus* and *P. ovoideus* were parasitised by four species of Hymenoptera, of which those identified were *Homalotylus flaminius* (Dalm.), and *Tetrastichus minutus* (How.). Parasitism was heaviest from September to early November, and the parasites overwintered in the pupal stage, the adults emerging in March or April. If *Pharoscymnus* spp. are to be established in new localities against *Parlatoria blanchardii*, only adults should be introduced, so that the parasites are excluded. The Coccinellids were also attacked by various fungi.

Pollard (D. G.). **The Occurrence of *Amsacta moloneyi* Druce on Cotton in the Sudan (Lepidoptera: Arctiidae).**—*Rev. Zool. Bot. afr.* **49** fasc. 3–4 pp. 265–272, 1 fig., 11 refs. Brussels, 1954.

In the northern Sudan, *Amsacta moloneyi* (Druce) is normally scarce and restricted to weeds, but it increases in some years and attacks seedling cotton. Such an outbreak occurred in the season of 1950–51 in the Gezira, chiefly in the central region. Larvae approaching maturity, a description of which is given, were found in cotton fields in the first week of September 1950. Weeds were severely damaged on fallow areas, and cotton fields adjacent to these showed the greatest injury. Infestation in cotton fields was heaviest at the edges, and it is concluded that the eggs of the Arctiid were deposited on weeds on fallow ground in August and that the larvae, after defoliating the weeds, migrated to cotton in search of food.

On cotton, the cotyledons and often the stems of the seedlings were completely destroyed, so that resowing was necessary. Plants bearing 2–6 leaves were attacked and the leaves destroyed in the same way, though damage was seldom so severe as on the younger plants. The optimum sowing date in the central Gezira is about 13th August, and sowing later or resowing decreases yield and grade; delay in the growth of plants that are damaged but not killed also decreases yield.

Emergence of the adults appears to be closely linked with the onset of the heavy summer rains; large numbers were observed during the early rains of June and July, when they were attracted to light. Larvae collected from cotton pupated during September 1950, but adults did not emerge until August 1951, indicating that there is one generation a year, with a long pupal diapause during the dry season. The rains of 1950 were exceptionally early and heavy, and weed growth was abundant. These factors may have helped to create conditions favourable for adult emergence,

oviposition and larval survival, but years of heavy early rains are not invariably associated with outbreaks.

A list is given of the wild food-plants of *A. moloneyi*; larvae have also been taken on a few vegetables, but these are not severely damaged.

Tams (W. H. T.). **A Pest of Coconut Palms in Portuguese East Africa.**—*Bull. Brit. Mus.* (*nat. Hist.*) Ent. **3** no. 2 pp. 69–73, 14 figs. London, 1953.

Descriptions and figures are given of the adults of both sexes and the larva and cocoon of *Trogocrada deleter*, gen. et sp.n., a Limacodid that was found feeding on coconut palms in Portuguese East Africa in 1952.

Dobson (R. M.). **A new Species of *Carpophilus* Stephens (Col., Nitidulidae) found on stored Produce.**—*Ent. mon. Mag.* **90** no. 1087 pp. 299–300, 1 fig., 4 refs. London, 1954.

Descriptions are given of the adults of both sexes of *Carpophilus halli*, sp.n., together with characters distinguishing it from related species. This Nitidulid was taken on stored rice in British Honduras, cacao in Nigeria and groundnuts in Sierra Leone.

Menezes Mariconi (F. A.) & Zamith (A. P. L.). **A vaquinha ou burrinho das solanáceas.** [*Epicauta atomaria*, a Pest of Solanaceous Plants.]—*Biológico* **20** no. 9 pp. 147–157, 5 figs., 24 refs. São Paulo, 1954.

Epicauta atomaria (Germ.) is a well-known pest of potato and other vegetables in Brazil. The distribution of this Meloid in the State of São Paulo in shown on a map, a list of its wild and cultivated food-plants is given, and it is stated that severe infestations were observed near Piracicaba in March 1954, the plants attacked including tomato, *Capsicum*, Swiss chard, spinach, *Nicotiana tomentosa* and *Crotalaria saltiana* (*striata*), the last three of which have not previously been recorded among its food-plants. Only the adults, which feed on the leaves, are injurious, the larvae destroying the eggs of locusts [*cf. R.A.E.*, A **26** 290]. In experiments on control, various contact insecticides proved toxic in the laboratory when the beetles were confined on sprayed leaves, BHC, DDT and parathion being the best, but even less toxic materials gave good results in the field and two fungicides (bordeaux mixture and a proprietary copper compound) were about as effective, all sprayed plants being free from infestation after five days. It is concluded that *E. atomaria* is repelled by most of the common chemicals used in plant protection.

Leiderman (L.). **Ação dos modernos inseticidas contra a broca pequena do fruto do tomateiro.** [The Action of modern Insecticides on *Neoleucinodes elegantalis*.]—*Biológico* **20** no. 9 pp. 158–161, 4 refs. São Paulo, 1954.

Three tests of sprays for the control of *Neoleucinodes elegantalis* (Gn.), an important pest of tomato in Brazil [*cf. R.A.E.*, A **39** 135], were made

at Campinas in 1953–54. All plants received a fungicide, and an adhesive was added to the insecticides, which were applied from the time when the first fruits were set. In the first test, poor results were given when eight materials were applied five times at fortnightly intervals, 0·06 per cent. parathion, which was the best of them, reducing the number of fruits attacked by only 25·7 per cent., as compared with no treatment. The fact that the eggs hatch in 7 days and that new fruits are produced every week is held responsible for the failure. In the second test, various ovicides were applied weekly 15 times, and the percentage reductions in undamaged fruits were 56·4 for 0·05 per cent. EPN (ethyl p-nitrophenyl thionobenzenephosphonate), 41 for 0·15 per cent. nicotine sulphate with 0·2 per cent. soap, 30·7 for 0·05 per cent. Metacide [6·1 per cent. parathion and 24·5 per cent. methyl-parathion] and 29·3 for 0·15 per cent. Sulphenone [p-chlorophenyl phenyl sulphone], other materials being less effective, as compared with no treatment. In the third, in which nine applications were made at weekly intervals, the percentage reductions were 65·5 for 0·04 per cent. parathion, 57·3 for 0·03 per cent. γ BHC as lindane, 52·4 for 0·06 per cent. dieldrin, 51 for 0·2 per cent. DDT, 49·5 per cent. for 0·06 isodrin, 40·3 for 0·06 per cent. aldrin, 30·6 for 0·2 per cent. toxaphene and 24·8 for 0·2 per cent. chlordane.

Vasconcellos (F. T. C.), Leiderman (L.) & Sauer (H. F. G.). **Estudo da ação de vários inseticidas orgânicos sôbre o bicho mineiro do café no interior das minas.** [A Study of the Action of various organic Insecticides on *Leucoptera coffeella* in its Mines.]—*Biológico* **20** no. 10 pp. 165–169, 5 refs. São Paulo, 1954.

An account is given of experiments in São Paulo in 1954 on the control of the larvae of *Leucoptera* (*Perileucoptera*) *coffeella* (Guér.) in their mines in the leaves of coffee [*cf. R.A.E.*, A **42** 227] by means of sprays of chlordane, BHC, DDT, dieldrin, aldrin, endrin, isodrin, toxaphene, parathion, Metacide (6·1 per cent. parathion and 24·5 per cent. methyl-parathion), malathion and Systox [diethyl 2-(ethylmercapto)ethyl thiophosphate]. In the first test, the percentage mortality of the larvae ten days after application was 7·2 for no treatment, 100 for 0·03 per cent. parathion as a wettable powder, 95·7 for 0·12 per cent. malathion in an emulsion spray, and less than 50 for the chlorinated hydrocarbons, which were mostly in wettable-powder form. The remaining tests were made with emulsion concentrates only. In the first of these, the mortality percentages ten days after application were 100 for 0·03 per cent. parathion, 97·6 for 0·05 per cent. γ BHC as lindane, 93·1 for 0·3 per cent. chlordane or DDT, 92·3 for 0·07 per cent. Systox, and 85 for 0·07 per cent. dieldrin or 0·03 per cent. Metacide, 80·9 for 0·07 per cent. endrin, 50 for 0·3 per cent. toxaphene and 35·7 for 0·07 per cent. aldrin, as compared with 10·1 for no treatment. In the second. they were 97·2 for 0·05 per cent. Systox, 91 for 0·09 per cent. malathion, 90·8 for 0·25 per cent. DDT, 87 for 0·04 per cent. lindane, 86·8, 85·5 and 85·2 for 0·08 per cent. dieldrin, endrin and isodrin, respectively, 83·6 for 0·2 per cent. chlordane, 81·6 for 0·02 per cent. parathion, 72·4 for 0·03 per cent. lindane and 66 for 0·02 per cent. Metacide, as compared with 21 on untreated plants. In the third, the mortality percentages after 15 days were 97 and 96·2 for 0·1 per cent. endrin and dieldrin, respectively, 94·4 and 93·3 for 0·04 per cent. Systox and Metacide. respectively, 93·7 for 0·025 per cent. parathion, 92·2 and 90·3 for 0·1 per cent. isodrin and malathion, respectively, 82·3 for 0·25 per cent. chlordane and 46·8 for 0·2 per cent. DDT, as compared with 16·3 for no treatment.

Tadit' (M. D.). **The Oriental Fruit Moth.** [*In Serbian.*]—*Plant Prot.* no. 8 pp. 50–54, 1 fig., 8 refs. Belgrade, 1951. (With a Summary in English.)

Cydia molesta (Busck) was observed on peach in Yugoslavia for the first time in 1937, when nursery stock from Skoplje was found infested. It was subsequently observed at Smederevo in 1946 and at Belgrade and Zemun in 1950, when twig infestation reached 50 per cent. In view of this, the bionomics and control of the moth are reviewed from the literature. Considerable damage was likewise caused by *Anarsia lineatella* Zell., which also attacks other stone fruits.

Mitit' (N.). **The Spread of the San José Scale in Yugoslavia.** [*In Serbian.*]—*Plant Prot.* no. 8 pp. 72–75, 1 map, 1 ref. Belgrade, 1951. (With a Summary in English.)

Quadraspidiotus perniciosus (Comst.), which attacks various fruit trees, was first found in Yugoslavia in 1934 near the Hungarian frontier. It has since spread to the west and south, and now occurs throughout the country north of the Sava [*cf. R.A.E.*, A **27** 690, etc.]. To the south of that river, large areas are infested in Croatia and Bosnia and smaller ones in Serbia and Macedonia.

Nonveiller (G.). **Pamukov moljac. Još jedna nova opasna karantinska štetočina kod nas.** [The Pink Bollworm. Yet another new dangerous Quarantine Pest in Yugoslavia.]—*Plant Prot.* no. 10 pp. 73–82, 3 figs., 11 refs. Belgrade, 1952. (With a Summary in French.)

Platyedra (*Pectinophora*) *gossypiella* (Saund.) was found infesting cotton at Bar (Montenegro) in October 1951 for the first time in Yugoslavia. It is thought to have been introduced with cottonseed imported since the war. It was found at Skoplje during the following winter in cottonseed imported from Pakistan. In view of the importance of the pest, all stages are described and information is given on its world distribution, food-plants, bionomics, and the damage caused. Measures for its eradication are outlined.

Carvalho (J. C. M.). **Neotropical Miridae, LII:** *Rhinacloa lepagei*, **n. sp. occurring on Cotton in Brazil (Hemiptera).**—*Rev. brasil. Ent.* **1** pp. 115–117, 6 figs. São Paulo, 1954. (With a Summary in Portuguese.)

Descriptions are given of the adults of both sexes of *Rhinacloa lepagei*, sp.n., a Mirid that was found damaging cotton near São Paulo in 1952 and is also recorded from Peru.

Papers noticed by Title only.

Black (L. M.). **Parasitological Reviews. Arthropod Transmission of Plant Viruses.**—*Exp. Parasit.* **3** no. 1 pp. 72–104, 7 pp. refs. New York, N.Y., 1954.

Vappula (N. A.). **Finnish Entomological Literature published in 1952 including** [titles of papers on] **Economic Entomology and Control of Insect Pests.**—*Ann. ent. fenn.* **20** no. 1a 17 pp. Helsinki, 1954. [*Cf. R.A.E.*, A **42** 64.]

INDEX OF AUTHORS

NOTICES

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Institute are requested to communicate with the Director. Authors of papers on economic entomology, whether published in entomological journals or not, are invited to send reprints to the Director for notice in the *Review*.

The Executive Council of the Commonwealth Agricultural Bureaux is a signatory to the Fair Copying Declaration, details of which can be obtained from the Royal Society, Burlington House, London, W.1.

The Annual Subscription, *in advance*, to a volume of the *Review* Series A (Agricultural) is 40s. post free; Series B (Medical and Veterinary), 20s. post free. Prices of Back Volumes on application.

Orders and Subscriptions should be sent to the Director, Commonwealth Institute of Entomology, 41, Queen's Gate, London, S.W.7, or through a bookseller.

CONTENTS

[Continued overleaf

CONTENTS—*cont.*

Printed in Great Britain under the authority of HER MAJESTY'S STATIONERY OFFICE
by The Eastern Press, Ltd., Reading.

(1791) Wt. P8522/3895 5/55 E.P. Ltd. Gp. 566. [A]